# TRAFFIC QUARTERLY

AN INDEPENDENT JOURNAL FOR BETTER TRAFFIC

APRIL 1952

Fatal Accidents
Firm Traffic Enforcement
Traffic Surveys in Indiana Cities
Transportation Mobilizes for Defense
Transposed Traffic Flow for Highway Safety
Roadside Features and Traffic Accidents
Inventory of City Traffic Safety
Connecticut's Point System
Uses of Scale Models
Why Toll Roads?

THE ENO FOUNDATION FOR HIGHWAY TRAFFIC CONTROL

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# Traffic Quarterly

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# Fatal Accidents

EACH year, as a basis of comparison, we express a ratio of deaths per million miles of travel. It is simple and serves a purpose. In theory, it is only a comparison of results. It seems less striking than to say that in 1951, fatal motor accidents killed 37,500 persons.

Neither statement provides information on causes, though either should stir the most apathetic official.

Well-kept accident records provide impressive information on accident causes. This valuable knowledge to a responsible high-level authority should incite the initiation of an action program, preventive and deterrent measures, comprehensive enough to convince the public that it can and must drive better—or not drive.

Our states have qualified personnel whose interest and aid should assure a workable and effective plan.

Fatalities consist of drivers, passengers, pedestrians and children, but always a motor and a driver are involved. In most cases the cause has been lack of responsibility or poor driving.

A classification of our driver public is a cross-section of our population from adolescence to old age. One in every three is authorized to drive.

Herein we have departed from our best American tradition: competence, thoroughness, and system. Worse, we annually recognize it in the destruction of life on our highways.

Driving is simple; good driving can be easily learned. The best driving requires the inescapable combination of a reasonable facility in the manual operation of the machine and a high degree of proper driver attitude. Our experience has clearly proved we cannot escape our duty to require it.

Some faults of our present system require a long-range educational program. Corrective methods for some lend themselves to prompt and facile measures. They require little increase in personnel, funds or new legislation. They do require a swift response with real determination.

A dollar fine for violation of a curb parking regulation is meaningless and ridiculous. Enforcement in minor violations is rapidly

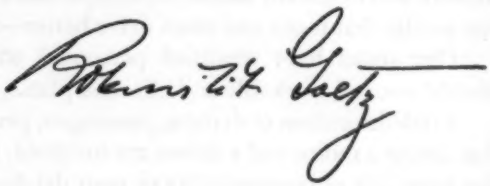
approaching a point of non-existence. The issuance of operator permits to incompetents is insufferable.

Serious violations invariably should meet with serious penalties: suspension, revocation, or re-examination in addition to appropriate punitive measures. Minor property damage in the absence of the owner should be reported to the owner.

These are examples of publicly recognized laxities.

Measures to correct them will awaken all drivers and be lauded by the law abiding public.

These or similar necessary measures have not been taken to any noticeable degree. As a result we may confidently expect our 1952 record to be not unlike that of 1951.



# Why Toll Roads?

WILFRED OWEN AND CHARLES DEARING

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*Mr. Owen has engaged in studies of transportation for the National Research Council, the National Resources Planning Board, and various government agencies. He has served as consultant for the Port of New York Authority. He is author of the Brookings book, "Automotive Transportation: Trends and Problems," and a study just completed for the Defense Transport Administration, entitled "Automobile Transportation in Defense or War."*

THE toll-road movement has created a dilemma in highway transportation. The federal government, opposing resort to tolls in the financing of highways receiving federal aid, is in the position of seeing important sections of the long neglected interstate highway system modernized as toll roads rather than free roads. These are the main roads in which the federal government has a primary interest. And the states, in general dedicated to the same free-road principle, are in the position of being unable to adapt traditional methods of finance to the tremendous task of bringing the highway system to standard adequate for today's traffic. Accordingly, through the dictates of expediency, numerous states are being forced to resort to revenue bonds secured by tolls.

Editor's note: This article is adapted by the authors from *Toll Roads and the Problem of Highway Modernization*, by Wilfred Owen and Charles L. Dearing, Brookings Institution, Washington, D. C. 1951.

## Reasons for the Toll Road Movement

The return of the toll road has been largely the result of failure to apply and adapt other more conventional financial tools to the problems of highway development. Despite the heavy investment required for main-road modernization and the impracticability of financing such programs out of current revenues, many states have refused to accelerate needed highway construction through borrowing. Little attempt has been made to bring tax rates in line with rising costs, despite the fact that the highway dollar has lost nearly half of its purchasing power. And in many cases revenues for roads are divided among the various road and street systems and among the many units of government participating in the road program with little regard for traffic needs. In half the states no provision of any kind has been made to protect main-road investment against the inevitable loss caused by failure to insulate the traveled way from the encroachments of abutting land uses.

Theoretically, the problem of providing high-cost facilities on main highways could be solved through traditional financing methods without resort to tolls. The requirement is to obtain the necessary funds and apply them to the routes in need of improvement. In most cases the magnitude of the needs would require borrowing, with the proceeds of the bond issue dedicated to specified highways. Tax rates might have to be raised to service the debt, and the revenues so earned would have to be earmarked for this purpose.

There is no question that in principle the sound approach to solving our highway problem today lies precisely in that direction. For the problem is much broader than the solution afforded by the toll road. Toll finance is applicable to only a limited mileage of high-density traffic routes; and in urban areas, where the most difficult traffic problems are encountered, it is generally impractical. So resolving the toll-road issue one way or another can affect only part of the total problem.

Substantial opposition is encountered, however, when attempts are made to alter defective highway policies. Opposition to borrowing and to tax increases and resistance to allocating motor vehicle tax revenues in accordance with traffic requirements have con-

tributed to the highway financing problem. Although the correction of these long-standing policy defects is necessary to an ultimate solution of the highway problem, such action may not solve the immediate difficulties which the persistence of these defects over a period of time has created. The task today is to effect changes that will provide immediate compensation for inadequate policies as well as a long-run solution.

Widespread failure to arrive at a sound solution to the highway problem stems from the failure to recognize that the highway is only one among a number of elements which together provide highway transportation service, and that all of the factors contributing to the final service need to be considered in decisions regarding the economics of the highway program.

The problem cannot be solved in isolation, but must be related to the total cost and quality of the final service. We cannot determine how much money could be productively spent for highways without considering the effect of various levels of highway expenditure on the total cost of all the elements entering into motor vehicle operation. Since an unsurfaced highway causes excessive vehicle operating costs, the improvement of such a road will reduce costs, including vehicle depreciation, tire wear, and gasoline consumption; and a net reduction in the cost of transportation may thus be achieved despite the outlay required to improve the road. Similarly, operating costs, time losses, and accidents can be reduced when facilities inadequate to accommodate the traffic using them are replaced by roads and streets that permit safe and expeditious vehicle movement. This balancing of costs and benefits provides a valuable guide to highway investment policies.

## Extent of the Toll Road Movement

Reappearance of the toll gate on American highways is potentially of much greater significance than is indicated by the few hundred miles of projects now in operation. The large number of states in which toll roads are authorized, planned, or under way, the importance of these routes in terms of traffic density, and the underlying factors which have led to the toll-road movement measure the real

significance of the trend. There are now only six hundred miles of major toll highways in the United States, but construction under way will double this total in the near future. Additional specific authorizations may again double the total when the availability of steel permits planned projects to get under way. Altogether thirty-two states have given consideration to toll roads as one way out of their highway difficulties, and nineteen have enacted some type of legislation.

During 1951 several new developments gave impetus to the toll-road movement. With the opening of New Jersey's 130-mile toll road, another link was added to the growing system of toll highways in the northeastern United States. New York voters approved a 500 million dollar bond issue for the nearly 500 miles of Thruway from New York City to Buffalo and thence westward to Pennsylvania. Pennsylvania completed the western extension of the Pennsylvania Turnpike to provide more than 300 miles of superhighway from Philadelphia to the Ohio line. The legislature in that state also voted to provide an extension of the Turnpike to connect with the New Jersey toll road. New Hampshire voted to study the feasibility of another toll highway in that state, and Indiana created a turnpike authority which is expected to extend the toll road system from the East Coast to Chicago.

## Conflicting Views on Toll Finance

The potential importance of the toll road is reflected in the sharp differences of opinion and intense controversy among public officials, the highway transportation industries, and motor vehicle user groups as to the merits and demerits of this method of financing highways. The American Automobile Association has expressed the view that toll financing is a return to eighteenth century thinking. The Keystone Automobile Club, on the other hand, has been an influential supporter of the Pennsylvania Turnpike and its extension. The Ohio Farm Bureau has stated that from the farmer's view-point, the toll-road movement is both uneconomic and undemocratic, while the Associated Farmers of California in 1947 submitted a proposal that California investigate the possibility of a

statewide development of toll roads in preference to the extensive "free" road program recently enacted.

The federal government also has divided views on toll roads. The Bureau of Public Roads has consistently opposed them, while President Roosevelt suggested them as worthwhile self-liquidation projects to be undertaken by the federal government; and both the Reconstruction Finance Corporation and the Public Works Administration participated in financing the Pennsylvania Turnpike.

In contrast to the opposition of such organizations as automobile clubs, trucking associations, and the National Highway Users Conference, highway users themselves have accepted the toll road as evidenced by their willingness to pay the extra charge. Moreover, despite the strong opposition of the federal road agency, the states continue to endorse the toll method of finance and to proceed with the necessary arrangements.

This wide difference of opinion among groups which presumably have a community of interest in efficient highway transportation suggests the need for a closer scrutiny of the forces underlying the toll-road movement and delineation of the areas of agreement and disagreement among supporters and opponents.

## The Overall Highway Financing Problem

During 1949, the Joint Congressional Committee on the Economic Report inquired of state government and highway department heads as to the needs for highway construction. The replies to this inquiry revealed that at that time the cost of correcting highway deficiencies on all road systems in the nation amounted to forty-one billion dollars. It was further estimated that new deficiencies would arise during the present decade at such a rate that between now and 1960 the states and their subdivisions would need to spend for construction alone approximately fifty-five billion dollars, in terms of 1949 prices, to bring the highway system to acceptable standards.

There is little likelihood that deficiencies of this magnitude could be overcome under current arrangements for highway support. At present, only a little over two billion dollars a year is available for highway construction at all levels of government. Even if it

were assumed that this annual two billion dollars would be spent where most needed, it would require twenty years to eliminate forty-one billion dollars of deficiencies. But during this twenty-year period new deficiencies would be arising at a rate that would in effect offset the results of the modernization program. So despite the effort to bring the highway plant to acceptable standards, it would continue at about the same level of obsolescence.

The magnitude of the highway financing problem is not adequately measured, however, simply by comparing total needs with total revenues. What makes the problem more difficult is that highway needs are concentrated on particular segments of the highway system, whereas laws and practices governing the expenditure of highway funds ordinarily make it impossible to concentrate highway construction where the needs are greatest. Because of these conditions, the most serious accumulation of deficiencies is found on the nation's most congested traffic arteries.

The magnitude of today's highway requirements results basically from the spectacular expansion of automobile ownership and use in the United States, which has afforded little time for careful highway planning or orderly development. In the race to furnish the new vehicle with ways to get about, it was not a question of building roads adequate for the future, but of providing usable facilities for immediate requirements.

The methods used to meet this demand appeared to be the only ones feasible at the time. Highway officials started with what was at hand, straightened and widened wagon roads here and there, and hoped that what had proved adequate for the vehicle of the past would serve as a good beginning for the requirements of the future. But the course of expediency resulted in perpetuating with relatively permanent surfaces a network of roads destined to prove totally inadequate in width, alignment, and other major respects.

Between 1920 and 1940 the combined construction program of federal, state, and local governments resulted in the surfacing of a million miles of highways. In terms of speed and physical dimensions this was an impressive accomplishment, but as a result of increased traffic volume, much of this effort proved to be far short of actual requirements. Traffic has since continued upward at a spec-

tacular rate. Motor vehicle registration in 1951 exceeded the 1940 level by more than fifteen million units; and highway use, as measured by vehicle miles traveled, had risen by nearly 50 per cent. Thus an unprecedented traffic load was thrown on the already obsolete highway system before even the deferred construction of the war years had been undertaken.

The significance of the postwar upsurge in traffic, however, is found not in the aggregate increase in vehicle miles operated but in the radical changes that have occurred in the composition of the traffic. Heavy duty and characteristically slower-moving trucks are using an increasing share of available highway capacity. Between 1941 and 1948, miles of travel by passenger vehicles on main roads increased 11 per cent, whereas miles operated by trucks increased 18 per cent. This increase in truck traffic, however, was far greater with respect to the heaviest trucks. During the same period, and on the same system of main roads, miles operated by single unit trucks (characteristically light vehicles) increased only 9 per cent, while operation of truck combinations (heavy vehicles) increased 54 per cent.

In view of these conditions, the question to be answered is apparent. If obstacles in the way of a prompt adjustment of our traditional system of financing highways continue to deny the funds necessary to accomplish the road building task that confronts us, to what extent can the toll road provide an alternative method of coping with the problem?

## The Toll Road as a Way Out

The toll road, since it makes use of revenue bonds secured by the earnings of the facility rather than general credit bonds, is not subject to state debt limitations. The toll charge, paid only by those who care to use the facility, avoids the political difficulties of raising the gasoline tax rate. The unique characteristic of a toll facility is that the money spent for it goes to build and maintain a specific project for which there is a need and a prospective willingness to pay the cost. These are the primary reasons why many states are resorting to the toll method of financing high-cost facilities.

Favorable reception of toll roads by the motorist has resulted despite the fact that their use involves an average passenger charge of 1 to 1.5 cents a mile. The added cost is equivalent to a gasoline tax of 15 to 22 cents a gallon. This payment is in addition to the average state gasoline tax of approximately 5 cents a gallon.

Presumably the motorist is willing to pay this high rate because the comfort, speed and relative safety of using a road designed to modern standards, as compared with conditions on parallel free roads, seem worth the extra charge. By paying more for the road, the motorist may actually pay sufficiently less in gasoline consumption, tire wear, and other operating costs to realize a net saving in his total cost of transportation. This is brought out by the fact that large numbers of long-distance truckers to whom cost is of vital interest are willing to pay to use a toll road.

The physical characteristics of a modern road which permit these savings in vehicle operating costs, however, are in no way peculiar to a toll highway. Many miles of highway provide a standard of service comparable to that of a toll road. The toll is merely a financing device to get the road quickly now, rather than tolerate inadequate standards for an extended period while the route in question awaits its turn for improvement.

Obviously, it would be preferable to enjoy modern highway facilities without resorting to toll charges. And there is no inherent reason why this should not be possible. To do so would simply require a revision of traditional methods of highway finance to adapt them to the realities of present-day requirements. It would be necessary to obtain the required funds through an adequate level of charges or through bonds where necessary, and to apply the proceeds where they are needed to provide maximum service to those who pay the bill.

That a solution to the highway problem along these lines has not been reached results in part from inertia and in part from the fact that existing policies in too many cases have resulted from compromise among the numerous interests involved rather than from objective appraisal of requirements. A basic defect is that tax rates and financial policies for the highway industry are determined by legislative bodies which cannot command the day-to-day expertness necessary for such tasks.

Basic reforms are therefore required to correct the inequities and shortcomings in present highway policies. Scientific programing and cost determination must be substituted for political decisions, and the budgeting of highway revenues must be guided by demands of traffic. Attainment of these goals will be hastened to the extent that the various highway transport and user interests adopt policy positions that reflect a more comprehensive view of the highway problem and a greater realization of the basic identity of purpose among all concerned with its solution.

Since it is clear that extensive revision of traditional highway financing policies on this basis will not be accomplished soon, there remains the problem of whether or to what extent the toll device should be used as a supplementary means of achieving the high-cost facilities that existing financial arrangements are often unable to supply. Some of the factors that must be weighed in arriving at a decision are illustrated in states which have decided that toll roads, whatever their drawbacks, offered the only solution to specific highway problems.

## Maine and New Jersey: Cases in Point

An understanding of the practical considerations underlying the development of toll roads is afforded by recent developments in Maine and New Jersey. In Maine, problems of finance have long prevented modernization of the state's most congested highway, U. S. Route 1. Basically the problem of U. S. 1 stems from the fact that Maine is a sparsely populated state with relatively few motor vehicles, and yet so situated geographically that heavy out-of-state traffic must be accommodated during the summer vacation season, particularly in the southeastern section.

Roads throughout the state have for a number of years been extremely inadequate. In 1947 a study of Maine's highway needs concluded that out of nearly 21,000 miles surveyed, 13,000 miles were deficient, or some 60 per cent of the mileage in the state. In addition, 2,500 structures out of 4,100 were reported to be below tolerable standards. The cost of remedying these deficiencies was estimated at 164 million dollars.

Income for highway purposes from all sources in 1947 including

federal aid was 23.4 million dollars. The fuel tax was already fifth highest in the nation, and the average for passenger car fees was sixth highest.

At the time the Maine Turnpike was begun, therefore, some 8.2 million dollars a year was available for road construction, to meet accumulated deficiencies of 164 million dollars. The difficulty of financing needed modernization of the highway system is not adequately measured by this comparison, however, since the amount of money available to the state in any one year cannot be applied to the particular parts of the system presenting the most urgent deficiencies. State law provides that there should be an "equitable" distribution of highway funds to the various counties, and to achieve this goal the division of construction funds among the sixteen counties has been made on the basis of population and federal-aid road mileage in each county. Such a formula gives inadequate weight to traffic, and has therefore failed to reflect the greater construction needs of the heavily traveled roads in the southeast part of the state.

The effect of these policies on the problem of modernizing the inadequate and heavily traveled U. S. Route 1, which the Maine Turnpike was built to relieve, had been apparent for some time. Twenty years ago the widening of this road south of Portland was begun in order to accommodate the heavy peak loads created by summer vacation travel to Maine resorts from the states to the south. Since only small portions of this program could be financed in any one year, there was little possibility of any major improvements, and least of all of relocating the road. Accomplishments consisted of widening on the same location, involving a fraction of a mile or a few miles at the most. There was no possibility of by-passing the numerous towns which constitute the principal bottlenecks on this route.

Although it was apparent that any acceptable solution required the by-passing of urban areas along the route, the affected towns offered concerted opposition. To this political opposition was added the fact that even if removal of the highway to a new location had been possible, there was no adequate provision in Maine for controlling highway access. Thus the highway relocation would have been accomplished at the risk of creating new roadside encroach-

ments which would in turn interfere with effective traffic movement. In view of these conditions, the possibilities of improving Route 1 to acceptable standards were not promising.

Even if these problems could have been solved eventually, the inability to incur highway debt without an amendment to the constitution introduced another obstacle. All major construction work on the primary system of Maine has been accomplished through the federal-aid program and the sale of bonds. Cumulative issues of state highway and bridge bonds reached 25.6 millions in 1933, and in 1935 the highway debt limit was increased to 36 millions. The provision was made, however, that bonds could not be reissued once they had been retired, so that in 1947, although only 10 million dollars of bonds were outstanding, it was not possible to increase the debt without an amendment to the constitution.[1]

The possibility of obtaining popular support for amending the constitution to provide for bond financing of a short section of Route 1 was considered to be out of the question, since this route is of direct concern to only two counties. Opposition to borrowing was especially strong since the problem of Route 1 had to a major degree resulted from peak-load conditions created by out-of-state traffic; and it was contended that such traffic, especially from Massachusetts to southern Maine resorts on week ends, was making insufficient payment for the use of Maine roads. This condition resulted in part from the fact that Massachusetts has a gasoline tax of three cents a gallon, compared to six cents in Maine, so that it was generally more economical to fill up before leaving Massachusetts.

In view of these conditions the possibilities of relocating and redesigning Route 1 to acceptable standards within a reasonable period of time were remote. The alternative decided upon to provide immediate relief on this route was to borrow the necessary capital for the construction of a new parallel highway through the issuance of revenue bonds which would not require a change in the constitution to make available the full faith and credit of the state. Paying off the loan through tolls collected from the users also provided a feasible way to assess out-of-state vehicles. Furthermore, construction of a toll road offered a means of assuring limited access

1 Maine State Highway Commission, *Maine Highway Needs*, p. 34.

design and of providing a through-traffic facility which could bypass urban areas along the route without political interference.

Most of the conditions that led to the toll-road development in Maine were present in New Jersey, some in more critical dimensions. Thus, the decision to construct the New Jersey Turnpike stemmed from a combination of heavy traffic, modernization requirements of large magnitude, inadequate revenues, and the prospect that neither an increase in user tax rates nor removal of the constitutional limitation on borrowing would be politically acceptable.

New Jersey, the second most densely populated state in the nation, has a state highway system which includes only one-sixteenth of the total road mileage but accounts for one-third of the total traffic volume. The cost of modernizing the state highway system over a thirty-year period was estimated in 1944 at 750 million dollars. In 1947, the state highway department increased the estimate to one billion dollars, and owing to the tremendous increases in both the volume and weight of postwar traffic, it was stated to be "imperative that some 600 million dollars be made available without delay."[2]

As in the case of Maine, prospective current revenues fell far short of any such sum. It was estimated at that time that gasoline taxes and motor vehicle registration fees plus federal aid would yield 321 million dollars in the five-year period, 1949–1954. Deducting approximately 215 millions for debt service, state police, state aid, and maintenance of the state highway system, a five-year total of some 106 millions would be left for construction. Because this sum would fall far short of urgent requirements, it was proposed that additional money be obtained through a one-cent increase in the gas tax (from three to four cents a gallon) and from bond issues totaling 280 million dollars over a ten-year period.[3]

The proposal to finance New Jersey's highway modernization program through a general bond issue, serviced in part by gasoline taxes, met with such concerted opposition that attention was turned

[2] Sigvald Johannesson, "Five Year State Highway Construction Programs," New Jersey State Highway Department, September 4, 1947.

[3] O. Herbert Fritzsche, "Projects Based on Bond Issue and Net Normal Income," New Jersey State Highway Department, revised May 10, 1948. A later estimate was prepared for the governor, listing projects which could be completed in six years with a 150-million dollar bond issue plus normal revenues.

to the possibility of toll-secured revenue bonds. The original plan to issue highway bonds was withdrawn, and the governor requested the highway commission to draft legislation providing for toll financing. The widespread support for this alternative was due partly to the need for proceeding rapidly with highway improvements and partly to the consciousness of New Jersey residents that large volumes of interstate traffic use the highways of that state, and that their contributions in gas tax revenues are insufficient to meet the extraordinary cost of providing the facilities required to accommodate peak load traffic.

### Raising the Necessary Funds

The basic condition underlying resort to toll financing, then, has been the widening gap between available revenues and the cost of bringing highway facilities to adequate standards. To the extent that highway construction estimates reflect actual needs, little can be done to change this side of the equation. Consequently, primary concern must be directed to the question of why revenues are not being made available in sufficient amounts to meet requirements.

Among the reasons are such secondary factors as inefficient highway administration and uneconomic distribution of the revenues available. These defects in public policy must be corrected if satisfactory management of the highway system is to be realized. But policy reform along these lines would not remove the difficulties standing in the way of an immediate reconstruction program. The basic factor underlying the toll-road movement is the inability to obtain the extraordinary financial support currently required for specific high-cost projects.

The revenues necessary to finance highway modernization may be obtained either by increasing current tax rates or by borrowing. It has been noted that tax increases have lagged behind the rise in prices, and that user groups have exerted considerable pressure to hold taxes to a minimum. Although a number of states have raised gasoline tax rates and adjusted schedules for other user charges, political formulas for distributing the proceeds have been retained.

Aggregate revenues have been increased, but in general no pro-

vision has been made for concentrating expenditure on the limited mileage of highways where the need for modernization bulks largest. Again, even though eventual correction of this situation were in prospect, the magnitude and nature of highway needs would cast doubt on the propriety of the so-called "pay-as-you-go" system. Why should present highway users be required to supply the full amount necessary to finance a modernization program which is planned to serve the traffic needs of thirty years or more?

The ultimate question, therefore, is whether bonds can be issued to make possible immediate capital outlays on specific highways. Obstacles frequently stand in the way of removing the constitutional prohibitions against borrowing for highways. But even if the traditional pay-as-you-go philosophy could be supplanted by bonding programs, there is no assurance that the proceeds could be applied to specific highways and in particular geographic areas in accordance with traffic priorities. Concerted opposition would arise from the same political forces that have produced unsound legislative formulas for the allocation of current revenues.

Two practical considerations, then, underlie the toll-road movement: the high cost and urgency of the highway improvement program and the resistance to policy reforms essential for meeting the challenge through traditional financing methods. Since the decision to solve the problem through toll finance has been made in a number of states and is contemplated in others, it is important to weigh the merits and demerits of this alternative, and especially to determine the long-range implications of toll highway finance in relation to the immediate benefits sought by this expedient.

## Advantages and Disadvantages

Study of toll road experience to date has led to the following evaluation:

1. The toll road solution at best can be applied to only a limited mileage of roads. Toll financing offers no solution to the problem of crowded city streets, and in rural areas it must be limited to segments of the road system carrying high density traffic in order to assure self-support. Consequently, even where acceptable, use of

this device would not eliminate the need for basic revision of highway financial practices affecting the highway system as a whole.

2. The cost of financing toll roads through revenue bonds is substantially higher than financing by state government bonds. Increased cost results from higher interest rates, discounts, and fees. In short, the general credit of the state is usually superior to that of a special toll-road authority. Recent toll-road developments have demonstrated, however, that it is possible to avoid part or all of these higher costs. New Jersey did so to a degree by a forward commitment plan of borrowing from institutional investors, with substantial reduction of financing costs.

In New Hampshire it was decided to borrow on the general credit of the state after toll-road cost and revenue estimates indicated so promising an outlook that the legislature was convinced that the state could not actually be called upon to aid the project. In New York a constitutional amendment was sought to permit borrowing for the Thruway at low interest rates by the use of general obligation bonds. However, the use of general obligation bonds for self-supporting facilities nullifies one of the principal advantages of the toll-secured revenue bond device, for the strict economic tests of feasibility are diluted.

3. Duplication of investment results where an existing right-of-way could be used for the reconstruction of the highway to limited access standards. However, such cases are rare since the decision to build a toll road generally presupposes intolerable conditions of width and alignment on the existing location. In most cases, a new right-of-way is required to provide limited access standards whether on a toll road or on a free road. Furthermore, in many areas the volume of present and anticipated traffic requires two routes in order to segregate long-distance from short-run traffic. In such cases additional investment cannot be avoided.

4. The cost of toll collection is a substantial item peculiar to the toll highway. It has been found, however, that the percentage of these costs in relation to total outlays decreases rapidly as traffic expands. In the case of the Pennsylvania Turnpike, this item amounted to only 3.5 per cent in 1941. A factor offsetting toll-collection costs, moveover, is the development of concession revenues

by toll-road authorities. Pennsylvania Turnpike concession revenues have been far in excess of toll-collection costs.

5. There appears to be no danger that free routes will be neglected in order to avoid competition with parallel toll roads. On routes where resort to a toll road is necessary to meet the needs of traffic, conditions on the free road would be such that maintenance standards could hardly be expected to influence the degree of competition with the toll facility. With respect to the similar charge that a modern free road would never be built parallel to a toll road, it appears that in the short run such a possibility would not arise inasmuch as construction of the toll facility presupposes lack of funds to modernize the free road. In the long run, however, it is apparent that if a state in the meantime found itself financially able to build a parallel free road, it would not in prudence do so if traffic could be served by the two existing roads. In that case, funds available for a new road could be applied to freeing the toll road.

6. Toll charges undoubtedly constitute a form of "double taxation." That is, the user most not only pay the toll but must at the same time pay the gasoline tax, the proceeds of which will be spent on other highways. It appears that the only logical solution to this situation is for the states to credit to toll roads a fair proportion of the tax earnings generated on such facilities.

7. A major deterrent to revenue bond financing is the uncertainty as to whether the roads so built will be able to pay their way in the long run. It has been contended that the state would have to take over unsuccessful facilities at a loss to the highway user. However, substantial safeguards are provided against such an eventuality by the careful surveys that are required before financing for toll facilities is forthcoming. If events should develop to prove these calculations wrong, however, it does not follow that the highway user would stand to lose. The bond holders who have accepted the risk in purchasing the bonds would in some cases have to absorb the losses incurred in refinancing the facility. In other cases the state might take over the road, but it would have a physical facility which up to that time would have been paid for out of tolls at no cost to the taxpayer. Thus the highway user would obtain an addition to the free-road system at reduced cost and would have benefited

throughout the life of the toll road to the extent that this facility relieved traffic on the parallel free road. Nevertheless, the possibility that the state might have to take over a toll road emphasizes the importance of planning these facilities as an integral part of the state highway system.

8. Toll facilities should be integrated as far as possible into the conventional system of managing and financing highway facilities. This follows from the fact that establishment of a toll authority might lead to damaging duplication of highway management, and to conflicts between state highway planning and the programing of toll-road development. Such duplication could be avoided by planning the road in conjunction with the state highway system as a whole, by maximizing the common use of engineering services and equipment, and by placing responsibility for the toll road in the highway department rather than in an autonomous authority.

On balance, arguments against the toll road are not of such overriding importance that they preclude serious consideration of this method of finance. A state faced with the problem of modernizing inadequate facilities at high cost should first examine the avenues of remedy through the revision of conventional financing methods. If these do not appear fruitful, resort to toll facilities may be advisable provided such facilities are integrated with the overall highway plan and carefully evaluated to assure their economic justification.

# The Annual Inventory of City Traffic Safety Activities

HARRY PORTER, JR.

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*While employed with the Council, he has made traffic surveys for San Antonio, Texas; San Bernardino and Fresno, California; Bend and Eugene, Oregon; Fort Smith, Arkansas; Sioux Falls, South Dakota, and Lancaster, Ohio. He has served as consultant for the Atomic Energy Commission, preparing reports for the Oak Ridge, Brookhaven, Los Alamos and Richland projects. He made surveys for the Air Corps at Kelly Field and served as traffic consultant for the Navy at Neville Island, Pittsburgh, Pennsylvania. He also did some consulting work for the Army at Camp Grant, Illinois. He has been closely associated with the Annual Inventory of Traffic Safety Activities, presenting analyses of reports in more than 400 cities. He is Secretary-Treasurer of the Institute of Traffic Engineers and past President of the Midwest Chapter. He is a member of the Illinois Association of Highway Engineers. Mr. Porter is President of the Wilmette Safety Council and member of the reserve police. He has served on a number of Engineering Committees in the Chicago area.*

THE total cost each year of highway transportation in the United States is 30 billion dollars. That includes money spent for automobiles, gasoline, tires, repairs and the other services for using motor vehicles.

Integral parts of automotive transportation are astounding

when we realize that nearly 50 million passenger cars, trucks and buses operate on our streets and highways.

There are 60 million licensed drivers in this country; 3 million miles of road surfaces from concrete to gravel, plus 300 thousand miles of city streets. In 1950, the motor vehicle mileage reached the unbelievable all-time high of 466 billion miles.

During the last fifty-one years, the automotive industry has produced 116 million vehicles and, in the years ahead, will continue to manufacture cars and trucks at an astounding rate, although there is some curtailment during the present emergency. We are a nation on wheels!

## Evils Long Recognized

The development of the automobile (unequalled except perhaps by radio or television) has greatly affected the location and operation of manufacturing, rural education, rural life in general, manufacturing industries, recreation, merchandising, crime and its prevention, and many other elements of our personal, social and economic life.

In this fast-growing system, the evils have been recognized for years: too many lives have been lost, too many persons have been injured, and the economic loss resulting from motor vehicle accidents has been too great.

The first impact of the motor vehicle was on our street and highway systems. Came the good roads movement; and the Federal Aid Highway Program inaugurated in 1916 accelerated the establishment of state highway departments and led to a national system of highways.

Standards of design and construction were gradually raised. At first the main thought was to build a pavement that would not go to pieces. Then, as speeds and traffic volumes increased, we began to look at highway design from a viewpoint of traffic flow. Highways were located and built like railroads with easy curves and grades taking the place of the old checkerboard section line roads. By 1924 motor vehicle traffic deaths were approaching 20,000 a year and there was an increasing demand that somebody do something about it.

Early that year the first national conference on street and highway safety was called by Herbert Hoover, then Secretary of Commerce. Delegates from all parts of the country and all interested agencies met and adopted a series of reports. Most outstanding was the emphasis placed upon the lack of uniformity in traffic laws. As a result, a Committee on Uniform Traffic Laws and Ordinances was created. Since the formation of this committee much has been accomplished. Likewise, uniform standards have been developed in other fields of traffic control and accident prevention and again it can be said that these developments have contributed greatly to better traffic movement.

During World War II with many restrictions, such as fewer vehicles, lower speeds, we experienced a noticeable reduction in motor vehicle traffic deaths.

Following World War II there was a sharp increase in travel and expected rise in traffic deaths. In fact, there were 5000 more traffic deaths during the first peace-time year than in the previous year. Officials and citizens became aroused, and the first President's Highway Safety Conference resulted in May, 1946. The purpose of this Conference was to set up an action program as a blueprint for traffic control and accident prevention.

At the second Conference in the following June, Paul G. Hoffman, chairman of the public-support group, in his stirring final address declared, "We must keep a score card of progress in the promotion of highway safety, a device that will tell us at a glance where we stand and what still needs to be done. We desperately need this fact-taking at least once a year to evaluate what has happened in individual states and cities. The moment we have a lapse in our summary of information, the action program will begin to falter—there will be no traffic or direction signs to mark the way ahead."

Briefly, it can be said that Mr. Hoffman was referring to *inventory* of city and state traffic accident prevention programs.

In October 1947, in an address before the Advisory Committee of the National Traffic Safety Contest, Thomas H. MacDonald[1] stated that the contest reports received from many cities and states

[1] Commissioner, Bureau of Public Roads, Chairman of the Committee of Judges for this Contest and Chairman of the Coordinating Committee of the President's Highway Safety Conference.

were more than a record; they were a scientific tool for measuring progress and uncovering failures and reflecting efforts of cities and states. The material was too valuable to be limited to contests, for it furnished an appropriate base for the annual report of the President's Highway Safety Conference. He also indicated that the report served three purposes: (1) a basis for awards; (2) a comparative analysis to permit continued advancement; (3) an annual score card for the Conference. Again an inventory of traffic control and accident prevention was intimated.

### Annual Inventory Is Essential

Soon after, in December of 1947, General Philip B. Fleming, then Federal Works Administrator and General Chairman of the President's Highway Safety Conference, made the official announcement that the "score card plan" would be used to keep tab on what states and cities were doing to reduce accidents and congestion:

"The score card will be an evaluation of the reports of the states and municipalities in the National Traffic Safety Contests and the National Pedestrian Protection Contests.

"I am in full accord with the opinion of the Conference that the nation and its various governmental units need take stock at least once a year. This score card will enable the nation and every state and city to know where we stand and what we must do to cut traffic accidents and congestion to its irreducible minimum."

Unquestionably the thought was again that an Annual Inventory is essential.

This announcement of expanded use of contest information required a most detailed and comprehensive study. Contest information was by no means adequate to permit a complete Inventory of Traffic Control and Accident Prevention and to determine progress.

For almost a full year, various organizations and individuals were banded together to study and prepare a more adequate appraisal questionnaire. Many meetings were held which resulted in a complete new set of forms. The Inventory of Traffic Safety Activities was born with a new look.

The city report contained nine sections while the state report

had ten sections on various phases of traffic safety such as laws, enforcement, engineering, school safety education and public information.

As now constituted, the Inventory belongs to the people who use it: the individual cities and states and the professional associations who have taken the responsibility for developing procedures by which appraisals can be made as well as the development of standards of performance.

Every policy decision as to questions asked and standards used for appraising performance is approved by an Inventory Advisory Committee made up of state and local officials.

It is emphasized here that this is not a National Safety Council program; the National Safety Council changed from the sponsoring agency to the staff or service agency.

Here are some of the national organizations directly concerned with content and use of the Inventory:

State and Local 'Officials' National Highway Safety Committee; National Conference on Uniform Traffic Laws and Ordinance; National Committee on Uniform Traffic Accident Statistics; Institute of Traffic Engineers; International Association of Chiefs of Police; American Bar Association; National Commission on Safety Education, American Association of Motor Vehicle Administrators.

The information reported by the forty-eight states and more than 700 cities is used in many ways. Its use for determining the various awards has become more or less secondary. More important is the use of this information for the development of appraisal values for city and state programs. In detail, the information is used:

1. To compile the annual progress report of the President's Highway Safety Conference; 2. to provide a basis for research and improve appraisal measures by which performance of individual cities and states can be judged; 3. as a basis for awards given by the Institute of Traffic Engineers, International Association of Chiefs of Police, American Bar Association and the National Safety Council; 4. to provide a detailed written analysis of individual city and state traffic safety programs. This analysis being in the form of an appraisal comparing the individual city or state program with approved and recommended standards.

### What Inventory Accomplishes

What does the Annual Inventory of Traffic Safety Activities accomplish? First, it provides an annual stock-taking of traffic accident prevention activities nationally, state-wide and locally. The Inventory program pools experiences of states and cities of similar size and problems, to develop performance "yardsticks." There are well over 100 such appraisal values now in use.

Through the awards given by various organizations, recognition is given for good work and further effort is stimulated. Occasionally the award idea is criticized. But when we are honest with ourselves there isn't a person who doesn't like to win. We are a competitive people.

The analysis service to cities is most important from a local standpoint. It aids self-appraisal and guides for improvement. In many states this service is made available, particularly to cities under 50,000 in a formal presentation by some state agency. Further, the analysis provides a tool for city-state liaison, since cities and states have parallel functions and should and can aid one another. It unquestionably generates public support for all traffic control and accident prevention activities.

The source and nature of the Inventory appraisal measures come under three classifications in the following order of preference:

1. The recommendations of the President's Highway Safety Conference; 2. the recommendations of the various national organizations; 3. the top 30 per cent performance levels. These are the performances equalled or exceeded by 30 per cent of the cities reporting.

In many instances, the Inventory appraisals in the first and second categories listed are actually the 30 per cent performance levels. They are quantities or activities over years. They have brought results.

It is emphasized that the Inventory appraisal measures are undergoing constant study and upgrading by the various interested organizations as we learn more about what we are doing in traffic control and accident prevention.

Tables I to VII list Inventory appraisal measures for cities from 10 to 500 thousand population. Eighty per cent of the municipalities

in the United States over 10,000 population are in Groups 4 and 5 (10,000 to 25,000 and 25,000 to 50,000 population). Let us take a typical city in group four and compare its traffic control and accident prevention program with the Inventory appraisal measures in the tables to illustrate the value as a tool for improvement. Assume the following basic factors in determining appraisal measures.

A. Population 40,000; B. Vehicle registration 14,000; C. Eight traffic fatalities during the past four years (average two per year); D. Four hundred and ten personal injury accidents during the past four years (average 103 per year); E. Eighteen hundred property damage only accidents during the past four years (average 450 per year); F. Ninety miles of paved streets; G. Twenty-one miles of arterial streets.

Appraising the city's traffic ordinance is merely a Yes and No procedure. In order to rank with the leaders, our typical city should have completed during the past four years a comparative analysis with the Model Traffic Ordinance approved by the National Conference on Uniform Traffic Laws and Ordinances. This city should have at least the provisions outlined in Table I.

Table One

TRAFFIC ORDINANCES

Every city should have completed a comparative analysis of its traffic ordinances with the 1946 revision of the Model Traffic Ordinance.

The ordinance should provide for:

A. ADMINISTRATION

1. Keeping records of all violations and their final disposition.
2. Maintaining drivers' records of all traffic accidents, arrests, warnings, etc.
3. Making traffic accident studies.
4. Specifically delegating authority for traffic engineering. The traffic engineering authority empowered:
   a. To install traffic control devices.
   b. To designate crosswalks, establish safety zones and mark traffic lanes.
   c. To determine those intersections at which no right, left or U turns shall be made, and erect signs thereat.
   d. To determine and designate "Stop" street intersections, other than at streets intersecting "through" streets and erect stop signs.

e. To erect signs prohibiting parking on narrow streets.
f. To determine locations of curb loading zones and place appropriate signs at such zones.

5. Licensing of bicycles.
6. Requiring that traffic summons be serially numbered, issued in quadruplicate form, and audited periodically.

## Typical City

The typical city has a central accident records bureau which spent 120 man-days on processing accident reports, preparing summaries and special studies. There were 555 reported accidents in this city during the current year, thus time spent on this activity compares favorably with the appraisal measure of 200 man-days per 1,000 accidents as indicated in Table II.

### Table Two

ACCIDENT RECORDS

1. A centralized Accident Records bureau should be maintained.
2. At least 200 man-days per 1,000 accidents should be spent on processing accident reports.
3. The 1950 Revision of "Uniform Definitions of Motor Vehicle Accidents" should be used as a guide for classifying accidents.
4. As a guide for coverage on accident reporting, the following ratio can be used:

   55 non-fatal injury accidents per fatal accident
   200 property damage accidents per fatal accident

5. The standard accident report form approved by the IACP and National Safety Council should be used.
6. Monthly or quarterly summaries and annual summaries of traffic accidents should be prepared on standard forms.
7. Original accident reports should preferably be filed by street location.
8. A cross-reference file to the accident report file should be kept—preferably a driver record file.
9. A spot map should be maintained.
10. Accident records information should be used for:
    a. Engineering—basis for design, regulations, etc.
    b. Education—furnish information for educational effort.
    c. Enforcement—determine assignment of officers, violations contributing to accidents, etc.

To check coverage on accident reporting, it is necessary to have the average of the past four years on injury and property damage accidents. Referring to the basic factors (d) and (e) the city in question had an average of 103 injury accidents and 450 property damage accidents for the past four years.

We note that the city's reporting ratio is 52 injury and 225 property damage accidents per fatal accident which compares very well with the ratio of 1—55—200 based on continuous research and many years' experience of cities with outstanding accident prevention programs. Standards on other items such as methods of compiling reports and summaries are shown in Table II.

To appraise the engineering program it is necessary to have basic factors, a, b, e, and f. The Engineering Department of our typical city is responsible for traffic engineering functions by ordinance, thus meets recommended criteria. However, only the equivalent of 75 per cent of one person's time was devoted to traffic engineering, administration, surveys and investigations.

To compare favorably with the Inventory appraisal measure on this item it needed at least the equivalent of 90 per cent (2.3 x 0.4) of one person's time. The equivalent time might be for example, the assistant city engineer devoting 50 per cent, one police officer 15 per cent and another police officer 25 per cent, etc.

The man-days for studies for high accident locations should equal at least 32 (80 x 0.4). On traffic control devices, regulations and improvements our city needed 17.1 miles of paved streets with center lines regularly marked (19 per cent of ninety miles of paved streets) and twenty-seven miles of streets with modern type of lighting meeting latest Illuminating Engineering Society standards. Other items can be compared in the same manner whenever an I.A.M. is given. Officials of our typical city might be interested in knowing how regulations such as one-way streets and prohibition of parking on certain streets compare with other cities in the population group. This information is shown in Tables III and IV.

The Police Department of this city reports forty-nine officers: uniformed officers, full-time, plain-clothes officers and part-time personnel working on regular schedules such as school crossing guards. That does not include radio dispatchers, stenographers,

Table Three

CITY TRAFFIC ENGINEERING INVENTORY APPRAISAL MEASURES

| Group | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Population (in 1,000's) | | 200–500 | 100–200 | 50–100 | 25–50 | 10–25 |
| Number of Cities eligible to report | | 31 | 58 | 126 | 269 | 850 |
| Number of Cities reporting | | 28 | 43 | 81 | 163 | 353 |
| Cities with a Traffic Engineer | | 86% | 60% | 20% | 2% | 1% |
| a. In Public Works, executive, etc. | | 96% | 96% | 81% | 100% | 50% |
| b. In Police Departments | | 4% | 4% | 19% | – | 50% |
| Cities without a Traffic Engineer | | 11% | 37% | 70% | 83% | 83% |
| a. Now handled by Engineering, Public Works, etc. | | – | 44% | 56% | 66% | 66% |
| b. Now handled by Police | | 100% | 56% | 44% | 34% | 34% |
| Not stated or no one responsible | | 3% | 3% | 10% | 15% | 16% |
| Authority—delegated by ordinance | | 71% | 49% | 21% | 24% | 22% |
| Staff—on administration, surveys, etc., per 100,000 population | I.A.M. | 2.3 | 2.2 | 2.2 | 2.3 | 2.3 |
| Budget (Rate per 100,000 population—1,000's) | I.A.M. | $46.3 | $33.0 | $25.0 | – | – |
| Parking | | | | | | |
| % of cities using meter revenue for traffic | | 34% | 41% | 56% | 54% | 52% |
| Off-street spaces per 1,000 registered vehicles in business areas for public use | I.A.M. | 110 | 105 | 105 | 105 | 105 |
| % of cities which can condemn property for off-street parking facilities | | 62% | 70% | 73% | 65% | 64% |
| % of cities completing parking lots in 1950 | | 89% | 77% | 77% | 72% | 50% |
| Maintenance of Control Devices (man-days per 100 miles of paved streets) | | 1,360 | 1,150 | 1,120 | 900 | 600 |
| Traffic Studies (man-days 100,000 population) | | | | | | |
| Accident studies | I.A.M. | 83 | 76 | 70 | 80 | 75 |
| Speed observation studies | I.A.M. | 26 | 33 | 28 | | |
| Checking plans | I.A.M. | 75 | 80 | 72 | 228 | 180 |
| Others | I.A.M. | 386 | 319 | 221 | | |

Table Three

CITY TRAFFIC ENGINEERING INVENTORY APPRAISAL MEASURES

| | | | | | | |
|---|---|---|---|---|---|---|
| **Traffic Control** | | | | | | |
| % paved streets with center lines | I.A.M. | 22% | 24% | 21% | 19% | 17% |
| % of intersections with marked x-walks | I.A.M. | 17% | 18% | 19% | 15% | 15% |
| Number of signalized intersections per 100 miles of paved streets | I.A.M. | 49 | 51 | 51 | 6 | 5 |
| % with pedestrian indications | I.A.M. | 25% | 12% | 20% | 20% | 20% |
| % of signs (stop, speed, etc.) replaced | I.A.M. | 23% | 22% | 22% | 28% | 26% |
| % paved streets as arterials | I.A.M. | 24% | 23% | 24% | 30% | 30% |
| % cities reporting one-way streets | | 100% | 96% | 67% | 74% | 59% |
| % adding in 1950 | | 75% | 56% | 25% | 22% | 10% |
| % of cities with no angle parking on main or business area streets | | 58% | 41% | 39% | 40% | 40% |
| % of cities prohibiting parking on main and business area streets: | | | | | | |
| All times | | 100% | 95% | 60% | 83% | 74% |
| Rush hours | | 100% | 79% | 41% | 42% | 17% |
| % of cities adding this regulation in 1950: | | | | | | |
| All times | | 82% | 67% | 41% | 21% | 18% |
| Rush hours | | 89% | 54% | 25% | 16% | 4% |
| % of paved streets with modern lighting | I.A.M. | 32% | 21% | 33% | 30% | 30% |
| % of cities adding modern lighting in 1950 | | 82% | 68% | 46% | 46% | 37% |
| % of cities installing new traffic signals | | 96% | 89% | 52% | 59% | 51% |
| % of cities adding pedestrial signals in 1950 | | 79% | 54% | 29% | 13% | 9% |
| % of cities coordinating additional signals in 1950 | | 72% | 68% | 48% | — | — |
| % of cities reporting expressways | | 53% | 28% | 24% | — | — |
| % of cities completing expressways in 1950 | | 14% | 9% | 5% | — | — |
| Number of channelized intersections per 100 miles of paved streets | I.A.M. | 7 | 8 | 6 | 6 | 5 |
| % of cities completing channelization in 1950 | | 86% | 54% | 20% | — | — |
| % of paved streets with special speed zones | | 8% | 7% | 12% | 18% | 18% |

NOTE: I.A.M. (Inventory Appraisal measure) performance equalled or exceeded by the top 30% of cities reporting.

Table Four

Special Summary

## CITY ENGINEERING—STREET REGULATIONS
## 1950 INVENTORY

Percentage of Paved Streets:

| Group | As Arterial Streets | As One-Way Streets | With Special Speed Zones Posted | With Parking Prohibited At All Times | With Parking Prohibited At Rush Hours Only | With Angle Parking Permitted |
|---|---|---|---|---|---|---|
| 1* | 19% | 2.2% | 5.3% | 3.7% | 2.6% | 0.1% |
| 2* | 24% | 3% | 8% | 7% | 4% | 0.3% |
| 3* | 29% | 4% | 9.5% | 4% | 1% | 0.3% |
| 4** | 23% | 2% | 13% | 3.5% | 0.4% | 0.6% |
| 5** | 28% | 1% | 15% | 4.5% | 1.9% | 1.4% |

Percentage of Arterial Streets:

| | | | | | |
|---|---|---|---|---|---|
| 1* | 11.7% | 28% | 19% | 13.8% | 0.6% |
| 2* | 12% | 32% | 19% | 15% | 1.2% |
| 3* | 12% | 33% | 15% | 4% | 1.0% |
| 4** | 10% | 54% | 15% | 1.6% | 3.0% |
| 5** | 3.0% | 52% | 14% | 7% | 4.8% |

* Average for all cities reporting.
** Average for the 25 top ranking cities in traffic engineering.

police reserves. To compare with leading cities in its population group, it needed sixty officers (1.5– rate for Group IV cities x 40). The time devoted to traffic law enforcement should equal sixteen equivalent full-time men. Leading cities of this size, however, had 21.2 equivalent full-time men (5.3 x 4.0).

Equipment requirements can be determined by multiplying 3.1, the rate for Group IV cities, Table V by 4.0.

Requirements under Training, Accident Prevention and General Traffic Law Enforcement are determined by using the standards. The typical city's performance can be also compared with the top 30 per cent performance for Group IV cities.

The number of moving hazardous violation convictions is always an interesting item. Our city had a four-year average of two traffic deaths per year. Thus, it should have during the current year at least 712 (356 x 2) convictions to rank with the top cities in traffic

Note: I.A.M. (Inventory Appraisal measure) performance equalled or exceeded by the top 30% of cities reporting.
% of paved streets with special speed zones . . . . . 18% 18% 12% 7% 8%

## Table Five

## CITY TRAFFIC LAW ENFORCEMENT INVENTORY APPRAISAL MEASURES

| Group | Measure and Source | Top 30% Performance of Cities in Group 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Population (in 1,000's) | | 200–500 | 100–200 | 50–100 | 25–50 | 10–25 |
| Number of Cities eligible to report | | 31 | 58 | 126 | 269 | 850 |
| Number of Cities reporting | | 28 | 43 | 81 | 163 | 353 |
| **PERSONNEL** | | | | | | |
| Total police strength per 1,000 population | IC | 1.6 | 1.6 | 1.6 | 1.5 | 1.4 |
| Full-time traffic men per 10,000 population | IC | 3.0 | 3.1 | 3.2 | (X) | (X) |
| Equivalent (a) traffic men per 10,000 population | 4.0 (PC) | 4.3 | 4.7 | 5.6 | 5.3 | 6.0 |
| Per cent of total force (a) on traffic | | 31 | 36 | 38 | 45 | 50 |
| Clerical personnel per 10 officers | | 1.5 | 1.0 | 0.9 | 0.8 | 1.0 |
| **ORGANIZATION AND ADMINISTRATION** | | | | | | |
| Percentage of cities reporting traffic division equal status to other divisions | yes (IACP) | 93 | 88 | 70 | (X) | (X) |
| Percentage of cities reporting merit system basis for pay advances and/or promotions | yes (IACP) | 85 | 65 | 60 | 53 | 46 |
| Working days per week | 6 or less (IACP) | 5½ | 5 | 6 | 6 | 6 |
| Working hours per week | 48 or less (IACP) | 44 | 40 | 48 | 48 | 48 |
| **EQUIPMENT** | | | | | | |
| Total patrol type vehicles per 10,000 population | IC | 3.9 | 3.7 | 3.4 | 3.1 | 3.1 |
| Percentage patrol type vehicles radio equipped 2-way or better | 100 (IACP) | 80 | 82 | 90 | 100 | 100 |
| **TRAINING** | | | | | | |
| Recruit traffic training hours per man | 50 (IACP) | 62 | 46 | 48 | 40 | 41 |
| In-service traffic training, 25 hours or more biennially to entire uniformed force | 25 (IACP) | 15 | 28 | 26 | 32 | 22 |
| **ACCIDENT INVESTIGATION** | | | | | | |
| Percentage of accidents investigated | 95 (IACP) | 98 | 99 | 97 | 100 | 100 |
| Percentage of investigated accidents resulting in arrests | 55 (IACP) | 70 | 58 | 51 | 50 | 50 |
| Conviction rate for accident arrests | 95 (IACP) | 88 | 95 | 96 | 96 | 100 |
| Special investigators per 15 deaths | 1.0 (IACP) | 1.5 | 2.9 | 6.6 | (X) | (X) |
| **GENERAL TRAFFIC LAW ENFORCEMENT** | | | | | | |
| Moving hazardous convictions per traffic death | IC | 1,100 | 442 | 568 | 356 | 413 |
| Percentage of cities reporting pedestrian enforcement | IC | 42 | 53 | 15 | 16 | 9 |
| Percentage of cities using chemical tests | yes (IACP) | 65 | 37 | 33 | 23 | 13 |

IC—Performance equalled or exceeded by top 30% of cities. (a) Full time plus part time.
IACP—Measures of International Association of Chiefs of Police. (X) Not applicable or incomplete.

law enforcement. This is a practical check but many enforcement administrators are guided by the "enforcement index"—convictions per injury accident which may vary from 10 to 40.

Traffic court statistics, procedure, administration and environment is again a "check" procedure. It will be noted that the quadruplicate type of traffic ticket and complaint recommended by the American Bar Association and the President's Highway Safety Conference is standard as far as appraising this phase of the program is concerned. Samples will be furnished upon request.

Table Six

TRAFFIC COURTS (Desirable Traffic Court Administration)

1. Judicial Statistics for Traffic Courts
   a. Courts handling traffic cases should be Courts of Record.
   b. Traffic cases should be separated from those of other offenses.
   c. Judge should have jurisdiction over a Traffic Violations Bureau.
   d. Schedule of penalties should be established by the Court.

2. Traffic Court Trial Procedure
   a. Traffic court should open with a ceremony.
   b. Traffic Judge should make remarks about traffic safety at each session.

3. Other Court Personnel
   a. A prosecuting attorney should be regularly assigned to the court.

4. Traffic Court Administration.
   a. The traffic violation ticket should be in quadruplicate, one copy used as the complaint.
   b. Traffic violation tickets should be audited, and such audit published.

5. Traffic Court Environment
   a. Traffic Court should be comparable in physical appearance to other courts in the city or county.

6. Traffic Court Penalization—Educational Activities
   a. The violator's record should be made available to the judge.
   b. There should be a meeting of the judges in the city, county or township to establish a uniform minimum fine schedule.
   c. The judge and prosecutor should attend a traffic court or judicial conference.

Percentage of cities reporting pedestrian violations . . . . . 42 55
Percentage of cities using chemical tests . . . . . 65 57 yes (IACP) 33
IC—Performance equalled or exceeded by top 50% of cities. (a) Full time plus part time.
IACP—Measures of International Association of Chiefs of Police. (X) Not applicable or incomplete.

## UNIFORM TRAFFIC TICKET AND COMPLAINT

CASE No. ..... DOCKET No. ..... PAGE No. .....

YOUR STATE, COUNTY, AND CITY PRINTED HERE } SS.

**No. 00000**

**COMPLAINT**

IN THE MUNICIPAL COURT OF .....

THE UNDERSIGNED, BEING DULY SWORN, UPON HIS OATH DEPOSES AND SAYS:

ON THE ..... DAY OF ....., 19....., AT ..... M.,

NAME .....
(Please Print)

STREET .....

CITY - STATE .....

BIRTH DATE ..... RACE ..... SEX ..... WT. ..... HT. .....

DRIVER'S LIC. NO. ....., DID UNLAWFULLY (PARK) (OPERATE)

MOTOR VEHICLE (REG. NO.) ..... STATE ..... YEAR .....

MAKE ..... BODY TYPE ..... COLOR .....

UPON A PUBLIC HIGHWAY, NAMELY AT (LOCATION) .....

LOCATED IN THE CITY, COUNTY AND STATE AFORESAID AND DID THEN AND THERE COMMIT THE FOLLOWING OFFENSE:

Six Principal Causes of Accidents

| | | | | |
|---|---|---|---|---|
| **SPEEDING (over limit)** (.....m.p.h. in .....m.p.h. zone) | ☐ 5-10 m.p.h. | ☐ 11-15 m.p.h. | ☐ over 15 m.p.h. | |
| **Improper LEFT TURN** | ☐ No signal | ☐ Cut corner | ☐ From wrong lane | |
| **Improper RIGHT TURN** | ☐ No signal | ☐ Into wrong lane | ☐ From wrong lane | |
| **Disobeyed TRAFFIC SIGNAL (When light turned red)** | ☐ Past middle intersection | ☐ Middle of intersection | ☐ Not reached intersection | |
| **Disobeyed STOP SIGN** | ☐ Wrong place | ☐ Walk speed | ☐ Faster | |
| **Improper PASSING AND LANE USAGE** | ☐ At intersection<br>☐ Between Traffic Lane Straddling | ☐ Cut in<br>☐ On right<br>☐ Wrong lane | ☐ Wrong side of pavement<br>☐ On hill<br>☐ On curve | |

OTHER VIOLATIONS (describe) .....

IN VIOLATION OF the (statute) (ordinance) in such case made and provided.

PARKING: Meter No. ..... ☐ Overtime ☐ Prohibited area ☐ Double parking

☐ Other parking violation (describe) .....

Conditions that Increased Seriousness of Violation

| | | | | |
|---|---|---|---|---|
| **SLIPPERY PAVEMENT** | ☐ Rain<br>☐ Snow<br>☐ Ice | **CAUSED PERSON TO DODGE** | ☐ Pedestrian<br>☐ Driver | **IN ACCIDENT** | ☐ Ped. ☐ Vehicle<br>☐ Intersection<br>☐ Right Angle<br>☐ Head on<br>☐ Sideswipe<br>☐ Rear end<br>☐ Run off Roadway<br>☐ Hit Fixed Object |
| **DARKNESS** | ☐ Night<br>☐ Fog<br>☐ Snow | **JUST MISSED ACCIDENT** | | | |
| **OTHER TRAFFIC PRESENT** | ☐ Cross<br>☐ Oncoming<br>☐ Pedestrian | ☐ one foot | | | |

AREA: ☐ Business ☐ Industrial ☐ School ☐ Residential ☐ Rural

HIGHWAY TYPE: ☐ 2 lane ☐ 3 lane ☐ 4 lane ☐ 4 lane divided

THE UNDERSIGNED FURTHER STATES THAT HE HAS JUST AND REASONABLE GROUNDS TO BELIEVE, AND DOES BELIEVE, THAT THE PERSON NAMED ABOVE COMMITTED THE OFFENSE HEREIN SET FORTH, CONTRARY TO LAW.

SWORN TO AND SUBSCRIBED BEFORE ME

THIS ..... DAY OF ....., 19.....

..... (Name; and title)

..... (Signature and identification of officer or other complainant)

COURT APPEARANCE: ..... DAY OF ....., 19....., AT ..... M.,

ADDRESS OF COURT .....

COMPLAINT MFD. BY WEBER BUSINESS SYSTEMS, INC., 117 W. SHIAWASSEE ST., LANSING 1, MICH.

***Prepared by American Bar Association Traffic Court Program***

FIGURE 1

## FUNCTIONS PERFORMED BY THIS TICKET

1. Serves as a legal complaint.
2. Serves as a traffic ticket.
3. Serves as a waiver for Violations Bureau.
4. Serves as a "court docket."
5. If desirable can be used as a written warning.
6. Can be used for parking violations.
7. Home city of non-resident violator can be sent one copy.
8. Has 24 boxes for checking 6 principal violations.
9. Has 21 boxes for checking 6 most common conditions.
10. Has 9 boxes for checking district and highway type.
11. Makes possible a uniform minimum fine schedule.

## MAKE-UP OF THE TICKET

1. Contains an original and 3 carbons.
   (a) First copy is complaint for the Court.
   (b) Second copy is for Officer.
   (c) Third copy is for Police copy.
   (d) Fourth copy (cardboard) is for Violator.
2. Each set of 4 copies contains its own carbons. Permits clear and exact copies.
3. Snap-out feature permits the removal of violator's copy and carbons in one simple operation.

School safety education Inventory appraisal measures emphasize the teaching of pedestrian and bicycle safety in all elementary and junior high schools, and both classroom and behind-the-wheel driver training instruction in all high schools. Other items in Table VII are considered, such as schools with active safety committees and P.T.A. or other similar organizations with active safety programs.

Table Seven

SCHOOL SAFETY EDUCATION

1. The supervisor of school safety education in each school system should be a qualified school person.
2. All schools should have active safety committees.
3. All schools should have active safety programs in groups such as PTAs or Parent Clubs.
4. All elementary and junior high schools should teach pedestrian safety.
5. All elementary and junior high schools should teach bicycle safety.
6. All high schools should give class room driving instruction.
7. All high schools should offer behind-the-wheel instruction.

PUBLIC INFORMATION

| Group Number | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Group (population in 1,000's) | 200–500 | 100–200 | 50–100 | 25–50 | 10–25 |
| Newspapers | | | | | |
| Column-inches of Safety Articles per daily paper | 3,200 | 2,200 | 1,600 | 800 | 800 |
| Column-inches of Safety Ads per daily paper | 930 | 350 | 350 | | |
| Safety Editorials per daily paper | 50 | 40 | 35 | 22 | 22 |
| Safety Cartoons per daily paper | 30 | 25 | 25 | 15 | 15 |
| Radio | | | | | |
| Use of Spot Announcements | All Stations | | | | |
| Total hours of Traffic Safety Broadcasts | 90 | 50 | 40 | 35 | 25 |
| Films | | | | | |
| Total showings in theaters | 12 | 12 | 12 | 12 | 12 |
| Showings before other groups | 250 | 100 | 100 | 30 | 30 |
| Safety Meetings | | | | | |
| Total Attendance per 10,000 population | 600 | 600 | 600 | 600 | 600 |

| | | | | | |
|---|---|---|---|---|---|
| Posters | | | | | |
| Total Locations (changed monthly) | 100 | 100 | 100 | 50 | 50 |
| Safety Literature | | | | | |
| Distribution of Traffic ordinance digest | yes | yes | yes | yes | yes |
| Number of other different pieces | Variety and good distribution | | | | |
| Special Emphasis Programs | Minimum of 5 themes used over 10 months | | | | |

Student accident reporting systems which include reports of accidents on school grounds, in buildings and in the home should be maintained by each school, since the report may be used in: adjusting the safety curriculum to immediate student needs; individual student guidance; modifying the structure and use of the building and grounds; and protecting the school from unfortunate publicity and liability suits growing out of accident cases.

Public information programs are of course equally important for they are the "mouthpiece" for accident prevention using all available media to get the safety message to drivers and pedestrians. To rank in the top 30 per cent in this population group, our typical city needed 800 column inches of safety articles per paper during the current year. If the city had one or more radio stations, the total of safety broadcasts should equal 35 hours.

Special emphasis programs are exceptionally important. These programs emphasize one particular safety theme each month and take advantage of coordinated national publicity. The city should tie in its emphasis programs with "Operation Safety" made available by the National Safety Council and each theme should be sponsored by a local public support group such as the American Legion, J.C.C. Service Clubs, etc. Full use of at least five of these themes during the year is the key to the entire public information job because newspapers and radio stations will gladly give time and space to local sponsors if community leaders are taking an active part.

Our city does not have a safety organization. Such an organization is necessary to coordinate all safety activities and also support official programs for improving traffic conditions. This organization

should have as one of its responsibilities the development of public support for a continuous, energetic and effective accident prevention program.

This typical example gives a clear conception of the value and effectiveness of keeping a "score card" or analyzing a city traffic control and accident prevention program by comparison with approved Inventory measures. It is the only method by which city officials can determine whether progress has been made and what part of the over-all program needs strengthening. Similar to any business, it must be on an annual basis.

### State-City Liaison

The City Inventory program provides the tool for state-city liaison. Many states have taken advantage by bringing the analysis of this to their cities over 10,000 population. These states have recognized that meeting with city officials, city groups and individuals in the respective cities to discuss the problem of safe and free movement of traffic is an excellent public relations vehicle for the agency taking part because it identifies both state and municipal governments as aggressive, honest and anxious to improve.

Wisconsin is a good example of states cooperating in the Inventory analysis service. For the last four years the Safety Division of the Wisconsin Motor Vehicle Department has assisted in bringing 100 per cent reporting from the thirty-two cities in the state with more than 10,000 population. Also for the last four years the Safety Division has made arrangements for a formal presentation of an Inventory analysis in all of the thirty-two cities. These meetings have brought closer together the state and local governments in an annual discussion of how the programs for reducing accidents and congestion on city streets can be improved.

A great deal of credit must be given to the city governments for improvement in moving traffic on city streets. Less congestion and smooth flow have been the net result. As far as traffic deaths are concerned, Figure 2 shows graphically the reduction in traffic deaths in the thirty-two Wisconsin cities since the comprehensive state-city

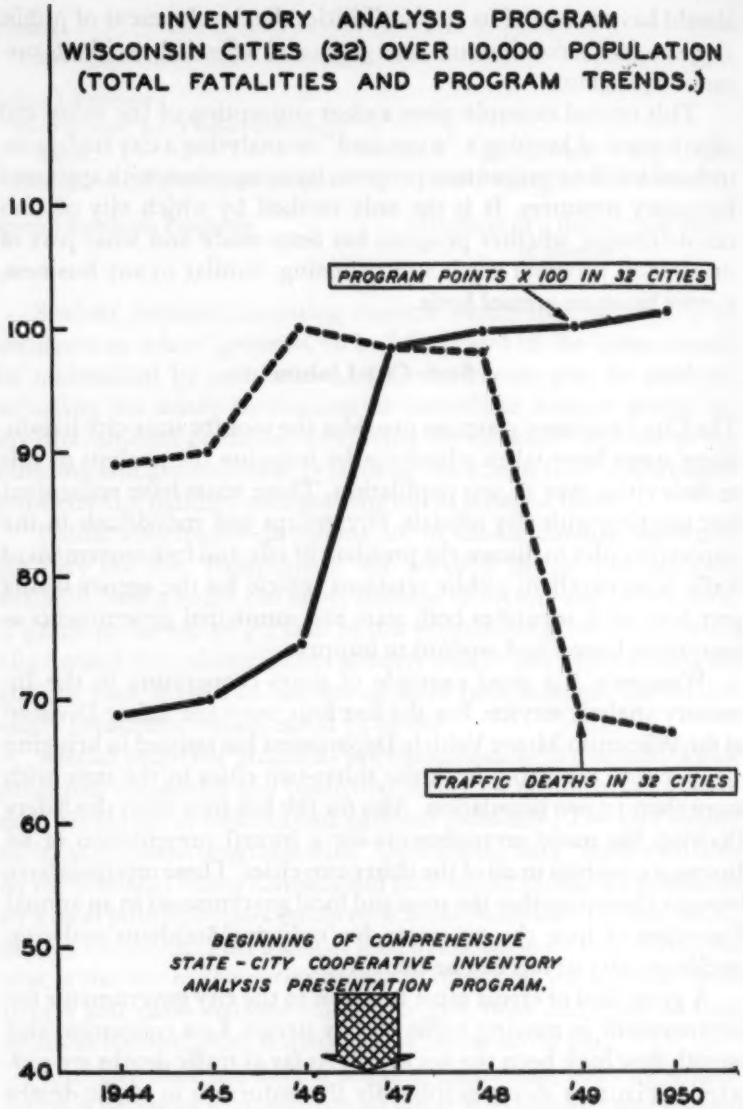

INVENTORY ANALYSIS PROGRAM
WISCONSIN CITIES (32) OVER 10,000 POPULATION
(TOTAL FATALITIES AND PROGRAM TRENDS.)
110
100
90
80
70
60
50
40
PROGRAM POINTS X 100 IN 32 CITIES
TRAFFIC DEATHS IN 32 CITIES
BEGINNING OF COMPREHENSIVE
STATE - CITY COOPERATIVE INVENTORY
ANALYSIS PRESENTATION PROGRAM.
1944
'45
'46
'47
'48
'49
1950

FIGURE 2

Inventory analysis presentation program. Since 1947 there has been a 30 per cent reduction in deaths whereas engineering, enforcement and public information programs in these cities have improved.

At the 1950 meeting of City Officials of Beloit, Wisconsin and representatives of the Wisconsin State Safety Division, City Manager A. T. Telfer stated, "Every year Beloit has voluntarily submitted a report in the Annual Inventory of Traffic Safety Activities. These reports are analyzed and recommendations are made suggesting corrective measures for situations where mistakes have been made.

"This service gives us an outside viewpoint. It is useful and is an advantage to the community, that is why we request it." He added that it gives city officials a chance to see what is going on in other cities of similar size all over the nation.

Only when we get down to cases will we further reduce congestion and accidents. This can be accomplished by better applying what we know from experience will achieve our aim. Inventory of traffic control and accident prevention is a must in determining progress and to point out parts of programs that need strengthening. For a nation on wheels, it is necessary that we handle traffic wisely. For then we handle it safely, which is vital to the economy of this nation.

# Transportation Mobilizes for Defense

JAMES K. KNUDSON

*Mr. Knudson came to Washington, D. C. in 1931 to attend college and entered government service as head of the Play and Pageant Department of the George Washington Bicentennial Commission. He became Chief Hearing Officer in the U. S. Department of Agriculture in 1934 and later as Commerce Counsel practiced for ten years before the Interstate Commerce Commission, the U. S. Maritime Commission, the U. S. Civil Aeronautics Board, and many state transportation regulatory bodies. He was nominated by President Truman to membership on the Interstate Commerce Commission and following confirmation by the Senate assumed that office on April 20, 1950. On September 9, 1950, by Executive Order of the President, he assumed additional responsibilities as Administrator of the Defense Transport Administration. Mr. Knudson is a member of the Bar of the Supreme Court of the United States.*

EVEN in normal times transportation so closely affects the public as to require a certain amount of regulation and supervision by local, state, and national authorities. For some of these controls, ancient misdeeds (or at least unwise activities) of railroads and other transportation agencies may be held partly responsible. But much more important is the growing complexity of our transportation problem in the wake of new inventions, new business methods, new competitions, a development demanding different methods of regulation in the public interest.

So much for normal times. But these are not normal times. We find ourselves confronted with a grave national emergency and with it the need for increased supervision by government, a sort of super-regulation beyond the scope of existing permanent agencies.

In this emergency the Defense Transport Administration is undertaking a task comparable to that performed by the Office of Defense Transportation in World War II. Differences in functions and activities are due to the differences between the two emergencies

and to changes in the national transportation picture during the last decade.

So it would seem helpful to consider the nature of this emergency; the organization, functions, and activities of the DTA (especially as they are concerned with highway transport), and some of the more significant recent changes in the field of transportation.

After the Japanese bombs dropped on Pearl Harbor on December 7, 1941, our country was clearly committed to total war; in the Wilsonian phrase, "War without stint or limit." This meant that the entire transportation plant of the United States would be used as a unit to hasten the victory we knew would eventually be ours. But the government did not "take over" the transportation plant or any important segment thereof, as it took over the railroads in World War I. There was no Director General of Railroads. Ownership and management were left in charge and continued to run the railroads, street cars, buses, truck lines, and the fleets on our inland waterways.

## Functions of ODT

But their activities had to be coordinated in the interest of national defense. So ODT came into existence, headed first by the man who was acknowledged to be our foremost transportation authority, Mr. Joseph B. Eastman, and after his untimely death, by the doughty and dynamic Colonel John Monroe Johnson.

It is a matter of general agreement that the ODT did an excellent job. It could—and did—give orders when necessary, but its success was largely due to the ability of its officials to secure voluntary cooperation of the various branches of the transportation industry. In rare special cases, in order to prevent interruption or complete disorganization of an individual transportation service, the ODT found it necessary to take a hand at operating certain transportation facilities.

The ODT exercised an important special function that grew out of the war machine's tremendous demand for our not unlimited supply of steel and other basic materials. It acted as claimant agency for transportation. In brief, it checked on the essential needs of the transportation industry and saw that enough steel was allocated to

transportation to keep the trains running to carry the munitions produced. It was Colonel Johnson's oft-repeated slogan that "There is no more of steel or of anything else than can be hauled."

After the war much was done through the National Security Resources Board to evolve a national transportation plan for mobilization in the event of war. These labors and the experience of the ODT proved of great service when war broke out in Korea and it became necessary again to supervise and coordinate all our transportation facilities in the interests of national defense.

But when DTA came into existence, it found a situation different from that in which the ODT had functioned. It was not the same kind of emergency. We were not fighting an all-out and declared war. We were officially at peace. We are now fighting an aggressor in Korea in order to discourage other aggression. We are producing the sinews of war on a gigantic scale not for immediate use, except for comparatively small-scale use in Korea, but to build up a stockpile for possible future use. We have to be strong to prevent aggression, to aid other free nations in peril of aggression, to build up a great international force to keep peace in the world.

All-out war may come. From day to day prognosticators change their minds as to when it will come—or whether it will come at all. What seems likely is that the world faces a period of small wars—those "savage wars of peace" Kipling wrote of—during which aggression or revolution may occasion bloodshed and destruction. There may be more Koreas. We are uneasy about Iran, Egypt, Indo-China, Burma, Jugo-Slavia. So we must keep our powder dry—and keep a lot of powder on hand. We will fight it out on this line if it takes, not all summer, but three or five or twenty years, until peace is assured.

This being a long-range program, we have to keep on living, and we intend to retain the American standard of living as far as possible. Such is the "guns and butter" program to which we are committed. Hence the demands upon the transportation system—though large and compelling— are not like those of a war to a quick finish, as in 1942–1946.

## DTA Objectives Limited

As part of the national defense mobilization policy, the President and his advisers decided to create only those emergency agencies absolutely needed to carry out the program; to keep these agencies down to a reasonable size; to confine them, as far as possible, within the framework of existing government departments and permanent agencies. This policy has caused a certain amount of confusion and some overlapping of authority. But it makes for a minimum of new controls and a maximum of economy. In the DTA we find a small agency—as government agencies go—employing only 215 persons, excluding 162 Interstate Commerce Commission personnel engaged in DTA activities. There were as many as 5000 in ODT.

One reason why the DTA can function so effectively with a limited personnel is because it uses many of the facilities of the ICC. It is housed in the ICC Building. It has the great advantage of being able to use the field forces of the ICC Bureau of Service, Bureau of Motor Carriers, and Bureau of Water Carriers and Freight Forwarders, thus making it unnecessary to set up expensive field offices and a large field force of its own. Many of the DTA objectives—like the railroad heavy loading orders—are accomplished through the issuance of ICC Service Orders upon the recommendation of DTA.

The DTA has been able to do its job with a minimum of order-giving. It carries out its programs primarily through voluntary public cooperation and participation. It encourages the use of private capital to the fullest extent possible in providing expansion of transportation facilities. Its programming and planning are the work of practical-minded and experienced experts both in and out of government, all working in concert.

This policy approach, it should be noted, does place a definite responsibility upon shippers and carriers and traveling public, who should do their best in the way of voluntary participation. And the success of their efforts will go far toward minimizing the necessity for future government controls.

It might be said, then, that the DTA is an agency of limited objectives. Certain branches of transportation have been excluded from its field of responsibility. The DTA has no control over pipe-

lines. Similarly, the DTA authority over inland waterways does not extend to coastal and intercoastal shipping.

The Executive Order (issued under the Defense Production Act of 1950) delegated the President's authority over domestic transportation, storage and port facilities to the member of the ICC who is responsible for the supervision of the Commission's Bureau of Service. This brought the writer into the picture. The DTA was created to carry out the writer's functions as delegate.

## Duties of the DTA

The general functions and responsibilities of the DTA have been officially enumerated under thirteen heads. They can be summed up in two sentences:

1. Coordinating and assisting the nation's domestic transportation plant, and storage and port facilities, to do their part in building up our national defense.
2. Working with different transportation lines—rails, highways, waterways—and allied facilities to bring their equipment and plant to a state of readiness to assume at a moment's notice such greater load as may be imposed upon them.

To handle its duties in the various fields of its responsibility, DTA is organized with eight operating and service divisions, handling respectively railroad transportation, street and highway transportation, inland water transportation, warehousing and storage, port utilization, equipment and materials, manpower, tax amortization and defense loans. Executives drawn from private industry head most of DTA's operating divisions. They are assisted by staffs both government-trained and from private industry, who are specialists in their respective fields.

The DTA Street and Highway Transport Division supervises and controls for defense mobilization purposes all domestic street and highway operation and equipment employed to transport passengers and freight by motor vehicles.

It does not overlap or usurp ICC functions in the interstate parts of this field or the functions of the states in their respective spheres.

It could, but it does not, and it will not unless the exigencies of the time so demand.

Included in this Division's field of responsibility are freight movements by for-hire carriers, private carriers, farm vehicles; also passenger movements by urban transit systems, intercity buses, school buses, taxicabs, hearses, ambulances, "drive-yourself" and rental cars and private automobiles. The total of all these added together—about nine million commercial vehicles and more than forty million private motor cars—fall within the area of DTA jurisdiction.

To make certain that the most extensive use is made of existing highway trucks and buses, and to aid individual highway operators to husband their equipment to a point where they will be able to assume promptly the additional load that a full-scale war would bring, DTA has provided plans and programs aimed at achieving these results.

Certain of these plans look toward improved operation and maintenance practices, more efficient use of manpower, conservation of equipment—parts, tires, fuel; and an adequate supply of new equipment—materials, parts, and supplies.

Under other programs, aimed at maintaining truck and bus fleets and other facilities, DTA (acting as claimant agency for transportation) has recommended that steel and other scarce materials be allocated for the manufacture of new equipment, or for such plant construction as may be necessary to the national defense effort. Here the Equipment and Materials Division carries the ball for the Street and Highway Division, and presents its requirements to the NPA. The DTA program for 1952 calls for one million new trucks, 64,000 trailers, 384,000 truck bodies.

Still other plans provide for accelerated tax amortization or direct government loans. These, upon DTA recommendation, can be granted qualified applicants who wish to expand their highway transportation facilities in the interest of defense. Here the Tax Amortization Division plays its part.

In all of these programs, the transportation industry is cooperating. The existing highway fleet is being maintained at as high a degree of efficiency as possible in view of the scarcity of materials

for repairs and replacement allocated by the Defense Production Administration. No less than two billion dollars worth of repair parts and materials will be needed during the current year.

The major problem of the Street and Highway Division, therefore, is to see that essential traffic is moved with existing equipment. But as the national mobilization and production program moves into high gear, traffic volume may be expected to move up correspondingly. Hence, use of existing fleets of motor vehicles must be increased to handle the load. That requires keeping constant tab on the highway transport picture over the nation.

Highway transport, of course, means highways. Such an authority as the Federal Bureau of Public Roads considers the nation's highway system as a whole far below par. Even many of our main roads are old, obsolete, out of repair, and though surfaced were not designed or constructed to carry today's heavy traffic volume, to say nothing of the even heavier traffic of tomorrow. Every highway user joins in the demand for more road building.

One highway engineer insists that recent tests prove "our highways cannot stand the beating of another all-out war effort." Whatever the fact in this respect may be, the complete remaking of our highway system must await the day when defense production no longer has the first call on materials and manpower. It is my considered opinion that highway users must for the present be content with the allocating of enough steel for adequate maintenance of essential existing roads and to build access roads to defense plants and new military installations—those completed, those under way, and those projected. There are access roads now too narrow, improperly located, inadequately surfaced, or otherwise substandard. These, too, should be put in order.

As for activities of DTA in the specific field of civil defense, when it comes to possible bombings or enemy attack, the agency hopes to play a definite role in close cooperation with the Federal Civil Defense Administration and other agencies.

The general position of the DTA is that when possible, even in an emergency, transportation equipment and manpower are to be used for the type of service for which they are best suited. The recognized danger zone is that overlapping of transportation authority

in an emergency would cause real difficulties unless plans were prepared for coordination beforehand. It should be a joint undertaking.

This discussion is mainly concerned with the work of the DTA Street and Highway Division as that is of greatest interest to most readers of the TRAFFIC QUARTERLY. But I cannot entirely omit mention of other activities of the agency. Our Railroad Transport Division's most pressing task has been that of building up the rolling stock of the railroads to meet coming necessities of the defense program, which will call for fullest use of our rail transport facilities. The freight car program (in which the railroads join with the DTA) calls for a total production of 300,000 new cars to create a total fleet of 1,850,000 cars as of July 1, 1953. Owing to inability to secure sufficient allotments of steel, in only one month have we seen the required monthly production of 10,000 cars. But we are pressing for the attainment of our announced goal.

The DTA Warehousing and Storage and Port Utilization divisions see that lack of storage and port facilities do not hamstring the defense transportation program. The Equipment and Materials Division has the job of securing the necessary steel to meet the transportation needs stated by the respective operating divisions.

Mention should be made of the recognition of the special functions of the freight forwarding industry by the appointment last October of a freight forwarder as a consultant on the DTA staff, who will aid in the more effective utilization of the industry in the defense effort. The manpower division of DTA is chiefly concerned with seeing that sufficient manpower is made available for essential transportation.

## Decade of Changes in Highway Transport

Those members of the DTA who had seen service with ODT found the greatest change in the transportation picture since World War II to be the extent to which more personnel were engaged in work connected with highway transport. This of course is due to the tremendous development of highway traffic in the United States during the last decade. It is not that the railroads have dropped back but that motor vehicles have been multiplying and finding new uses as

our entire highway system is being remade to meet modern-day demands.

If we were to go back as far as 1917 when we entered World War I, we would find that the United States had about 4,859,000 privately owned motor vehicles running over some 257,000 miles of surfaced highways. Of these vehicles, about 300,000 were trucks.

It should be said right here that many trucks and buses even back in World War I performed valuable service in carrying troops and military freight. We all recall those French taxicabs which helped to stem the advance of the German drive on Paris.

But it was World War II, a quarter of a century later, that gave highway transportation a chance to render full-scale war-time service. By that time the United States had 1,483,000 miles of surfaced highways and about 34,800,000 motor vehicles of all kinds, of which some five million were trucks and 117,000 were buses.

At present this country has 3,322,000 miles of surfaced highways and streets. More than 52 million motor vehicles move in a never-ending stream along these roadways. Certainly it seems unending to the man who is out for a Sunday afternoon drive and finds his car slowed down by heavy traffic a large part of the time. Of the 52 million motor vehicles, about nine million are trucks of various kinds. In the decade 1941–1951 truck ton-miles operated were doubled. In the same period, truck and truck-trailer production averaged approximately one million a year.

Because of their flexibility, ease of operation, maneuverability, and quick turn-around characteristics, motor vehicles can perform certain kinds of service much better than some other forms of transportation.

Whether it be short-haul tank trucks carrying their loads of petroleum and other liquids so essential to the rearmament program, or dry-cargo trucks bringing a steady stream of raw commodities to the doors of industrial plants, or both dry and tank trucks carrying away from plants to stockpiles and shipside the products of refineries, steel mills, and assembly lines; or again whether it be buses bearing contingents of troops from their homes to training camps, from training camp to point of embarkation—in all cases highway vehicles once again demonstrate their high usefulness and untiring value.

While trucking is a huge industry by any measurement of plant or performance, it is also a congeries of small businesses. The 25,500 truck fleets containing more than eight trucks each total less than 15 per cent of all trucks in use; and 56 per cent of all trucks are owned by individuals possessing no more than a single truck.

The variety of work now done by trucks reflects the varied structure of American industries. Special types of truck are used by such industries as baking, dairying, ice cream, frozen food, coal, lumber, petroleum products. More than two million trucks are in daily use by farmers or by farm-supporting activities. Sixty-nine per cent of all livestock moves to market by truck. So do more than half of our fruits and vegetables, and practically all live poultry. In our cities, the big milk trucks and the smaller delivery trucks have replaced the once familiar milk-man's horse.

It is estimated that something like 90 per cent of all household goods are moved in motor vehicles. This door-to-door service minimizes extra expense in crating and handling. Some 60 per cent of new automobiles are transported by highway carriers. The newly developed refrigerator trucks move perishables and keep them fresh until they reach consumer or retail distributor. Motor vehicles of various specified types are used effectively and economically in such operations as construction, logging, mining, and house moving.

In the last war tank trucks were brought into service when railroad tank cars had to replace ocean tankers for long-haul service, and their use in short-haul service has been increasing ever since. Shippers appreciate faster delivery in smaller quantities, requiring less storage capacity and permitting smaller inventories. Figures on the amount of petroleum products carried by truck are incomplete, but a recent survey estimated the present petroleum for-hire tank fleet at 2,635 trucks, 11,628 truck tractors, 11,628 semi-trailers, and 2,875 trailers, with a total fleet capacity of 73,024,635 gallons. An estimate of the private fleet at the end of 1950 showed 86,074 trucks, 12,444 tractors, and 12,520 trailers.

With the trucking industry growing so fast, a word of caution is in order. It is always possible that somewhere along the line a boom may generate a boomerang. Professional truck drivers may well assume the responsibility of setting standards for safe and careful

driving for other users of the highways. Much can and should be done by the trucking industry to promote safety practices designed to cut down the shocking toll of fatal highway accidents. Highway common-carriers should be conscious of their common-carrier responsibilities and should make no distinction in service as between the more and the less profitable freight shipments. Truckers might well work for quicker operation at terminals, for better cooperation between competing lines, for greater coordination between over-the-road schedules and pick-up and delivery; they should concentrate upon loss and damage prevention.

Common-carrier highway passenger transportation during the last decade affords no spectacular figures showing a big increase in the number of vehicles on the road. But it is a matter of common knowledge that more and more people are traveling by bus. The bus lines are using improved vehicles with greater carrying capacity and they are running on more frequent schedules.

The substitution of buses for trolley cars on city streets and suburban highways has become almost complete. There are now some 2,700 intercity common carrier bus enterprises using more than 33,000 buses. More than 1,500 of these carriers are subject to ICC jurisdiction because of the interstate character of their operations. New city terminals like the one operated by the Port of New York Authority on Manhattan Island are among the many new facilities that are making bus travel more popular.

The school bus has become a significant part of the national transportation plant. The "little red school house," the district school of our fathers' day, has been replaced by the more commodious and efficient consolidated school of today, requiring the transportation of students to and from the building. And of course in recent years the total school enrollment has jumped (partly due to the large number of war-time marriages). In the school year 1941–42 some 92,000 public school buses alone carried 4,100,000 pupils to and from their studies; in 1950; 110,000 buses carried 6,500,000 boys and girls.

Taxicabs are now common carriers. One taxi company carried more than 50 million people in New York in 1951. And Washing-

ton's 8,000-plus cabs are an essential part of the capitol's busy public transportation system.

### Survey of Automobile Transportation

In the too often acrimonious interchange of words between the railroads and the highway common carriers, it is sometimes forgotten that the really dangerous competitor of each is the privately owned motor car. It is estimated that in 1949, of 360 billion passenger miles traveled, nearly nine-tenths were by highway; about 84 per cent by private auto, 6 per cent by intercity bus, 10 per cent by rail.

Attention has been called to the fact that the private car has become so essential a factor in transportation that it is part of the responsibility of DTA's Street and Highway Division. Indeed, the agency has found it so necessary to study this development that it has sponsored a survey of automobile transportation by the Brookings Institution. Certain conclusions reached in that report merit our attention.

We are all aware of the shift of the automobile from the luxury class into that of a household necessity. At the present time 95 per cent of the cars in use perform necessary functions at one time or another. About twenty-two million people use privately owned cars either on the job or to go to and from work. About 68 per cent of automobile mileage on any given day is run up in making a living and doing family shopping, and one-half of all the cars are being so used. In view of this increasing necessary use of the automobile, it is estimated that to do the work performed by twenty-five and one half million cars during World War II, about thirty million will be needed if World War III comes. To produce the cars needed in case of all-out war would require an annual production of about four million cars during the present emergency period and the continuance of some production even during full-scale hostilities.

A notable development of recent years in the passenger automobile field is the growth of the rental, leasing and drive-yourself business. In a decade it has grown from a $4 million to a $40 million industry.

This discussion has centered about highway transport, but I do not admit that the railroads are becoming outmoded. They remain the backbone of our transport system. They are absolutely essential for moving certain types of commodities over long distances, and their usefulness increases in time of war or heavy defense production. Railroad management realizes the necessity of meeting the new competition with more efficient operation (as shown in the dieselization program) and doing best those transportation services for which the railroads are best fitted. Yet we cannot shut our eyes to obvious changes in the national economy and one of them is the disappearance of the railroads' one time virtual monopoly of intercity land transportation. It may be said in passing that there is substance to the railroads' complaint that they are subject to much regulation which assumes that such monopoly still exists.

The railroads are learning to be truck and bus operators themselves. They operate highway bus lines and depend on bus companies to supplement rail service. They are using trucks more and more for less-than carload service, in supplementing line-haul rail service, and for urban pick-up and delivery. This is a highly desirable development and the extension of such practices should be encouraged.

Much might be said of the amazing growth of air transport and its effect on railroad passenger traffic; of the causes and effects of the almost complete disappearance of American coast-wise shipping. But all that is another story—many other stories.

The DTA is concerned with the most effective use of the nation's transportation plant—more directly with that portion of it for which the agency is officially responsible. Actual full-scale warfare would change the picture, compelling more and stricter controls, enlarging the organization to meet its extended activities. Such expansion can be readily based on the present set-up—according to plan.

If on the other hand the shadow of war should disappear into the limbo of past world crises, the record of the agency's work may be a valuable aid to those in and out of government who will try to solve the long-range problem of transport regulation. Some of the nation's best brains are at work channeling the effects of new inventions, new transportation practices, into a new unity among transportation men to end ruinous forms of competition which are as

unwelcome to shippers and the traveling public as they are to managers and investors.

New emergencies may call for other government agencies in the decades ahead, and I hope that the success of the DTA in doing its job with a maximum of "let's work it out together" will leave behind a pattern for future government transportation policies.

# Firm Traffic Enforcement

GEORGE D. NEILSON

*Judge Neilson has been Judge of the Municipal Court, District of Columbia, since 1940. From 1933 to 1940, he was Assistant Corporation Counsel for the District of Columbia. He is a member of the American Bar Association Committee on Improvement of Traffic Courts; a member of the Inter-American Bar Association; of the Society of International Law, and of the Federal Bar Association. His success in cutting down the volume of traffic violations has won him national commendation. While serving as a prosecutor he obtained the first recorded conviction of a streetcar motorman on a charge of reckless driving.*

THE nation struggles to preserve freedom at home and abroad. The President is calling for every effort to preserve man-power and material for defense. The time is at hand to subject traffic and other practices to a searching study, to determine if society as a whole is receiving from its citizens the greatest possible benefits in these critical times.

The automobile, and all that goes with it, bears directly on our defense efforts. It is a national tragedy that thousands of lives and a tremendous amount of personal property are destroyed annually on our streets and highways. This is an indictment the American people must answer. The nation that gave birth to the automobile has the obligation to prevent accidents as far as humanly possible. To achieve this result requires vigorous, concentrated effort of all parts of society. These include not only the various local, state and federal governments, but also industry, private organizations and individuals. Obviously, traffic enforcement agencies, including the traffic court, have a direct and important responsibility in this matter.

What constitutes adequate penalties for traffic offenders is a question on which agreement is lacking, despite the urgent need for some semblance of consistency in imposing penalties. It is not uncommon to find consistency lacking among different traffic judges of the same courts throughout the country; and even the penalties of

the individual judges in themselves are, in far too many instances, devoid of the consistency so necessary to a fair and intelligent handling of the problem.

This does not mean that penalties should be rigid, but it does mean they should be at least consistent. Otherwise the court cannot escape the charge of discrimination. Obviously, each case must be judged according to its own facts, with the defendant's prior record being carefully considered. There is no suggestion that the judge should not have wide latitude and discretion in the manner in which he disposes of his daily calendar. However, this too often has been the guise for imposing penalties that could not be justified by the facts.

It is true the court must consider many factors in reaching the decision as to what the penalty should be in any given case. But where the facts are the same, or nearly so, with no unusual mitigating circumstances, then the penalties, over a period of time, should show some consistency. When the public is aware that each violator will receive the same, or similar, treatment when the facts are the same or similar, the traffic court will command far greater respect, and greater cooperation with the authorities will result to make the streets and highways safer for life and property.

### Sure Punishment Important

If more drivers were punished for violations, there would be fewer accidents. The certainty of the punishment is the important thing. It is perhaps the most vital step in effective handling of the traffic enforcement problem. Drivers who take chances on escaping punishment are encouraged in their careless tendencies by the belief that the odds favor them. As long as the operator believes his chances of being punished, even if he is caught, are slight, he is likely to continue his irresponsible driving. He realizes that in the first place he must be apprehended by the police, and by the law of averages it will be impossible for the latter to catch up with him every time. If, and when, they do, the penalty probably will be a small money fine. So, he reasons, why not take a chance?

Of course, this attitude is the result of fallacious reasoning. It

overlooks the tragic but nevertheless real fact that the life the driver sooner or later is likely to take may be his own. Every time he violates a traffic law, especially one of those in the category causing most of our highway accidents, he moves one step nearer to his own injury or complete destruction.

I condemn the sporadic traffic drive. It is the "lazy man's" way of coping with the traffic problem. Nothing less than constant vigilance will even come close to accomplishing the task at hand—the prevention of unnecessary accidents. Whatever benefits are derived from the occasional "crack down" by the police or the courts are purely temporary. Experience has shown that shortly after the expiration of these drives, irresponsible driving reoccurs. Unfortunately, loss of human life and destruction of valuable property from collisions caused by reckless and drunken driving go on every hour of the day—not for one day, one week, or one month—but for 365 days throughout every year. Full and continuous cooperation by the police, prosecutors, courts, and the public in general is of the utmost importance. The sooner we, the American people, realize this fact, that much sooner will we begin to achieve our goal. Unless we are prepared to meet the problem head-on and pay the price for safety, we might as well be content to sit idly by while the sabotage of the nation's man-power and valuable material continues unabated.

The traffic judge should bear in mind that uncertainty of punishment besides breeding disrespect for the law, has another disastrous influence on safety. It is discouraging to the police force. Traffic officers, who are called upon during all hours of the day and night to risk their own lives in the apprehension of offenders and then spend many hours in court, often on their own time, naturally lose interest in the performance of their duty if they know that in the end there is no assurance defendants will be punished. Court files throughout the country bear evidence that major traffic offenders—hit-and-run, reckless, or drunken drivers—time and again have been apprehended by vigilant police officers, only to see the offenders walk out of traffic court with no penalty whatsoever, or at most a small money fine, assessed against them. Such a result tends to break down the entire traffic enforcement structure, and the public is the principal loser.

The traffic judge is a powerful influence for good or for bad on

the entire traffic safety program. His influence for good is great if he gains for himself and the court the confidence and respect of the public.

In considering the whole question of penalties, the court must have uppermost in its mind at all times the thought that education is of paramount importance. The judge, in the final analysis, has it within his power to educate while he adjudicates. To achieve the best results, the traffic court should be primarily corrective rather than punitive. At times progress may seem unduly slow. However, we should not lose sight of the fact that education is by its very nature a slow process. Public officials and private individuals interested in this important subject should not become discouraged if the public in general fails to respond as quickly as desired. Again, it is the certainty of sustained progress that counts, not necessarily the degree of progress. As long as progress is being detected, there is definite assurance that the program of traffic education is succeeding. When viewed in this light, there is no room for pessimism, but every reason for encouragement and continued zeal in dealing with the problem.

The modern traffic school, operated primarily but not exclusively for traffic offenders in some of our cities, was established on the theory that education is at the very root of the problem. These schools, where properly organized and functioning, have proved a great asset to traffic judges in their efforts to improve the general attitude and calibre of the nation's automobile drivers.

An example of a highly successful school is the one established in the District of Columbia in 1948 by order of the District Commissioners, and operated by the metropolitan police department. The judges of the Municipal Court of this city, which has jurisdiction over traffic cases, have given their whole-hearted support to the traffic school. From the beginning they have realized that the school affords an ideal means of advancing the cause of true traffic education of making good drivers out of bad or potentially bad drivers. The judges know their efforts are achieving worthwhile results when violators, referred to the traffic school with their own consent, report to the court after successfully undergoing an intensive course of instruction.

Through lectures covering a wide range of traffic subjects necessary to adequate comprehension of the problems of sane and safe motor vehicle operation, and supplementary moving-pictures and photographs, the student is instilled with good driving practices on one hand, and the tragic results of irresponsible driving habits on the other. He sees vividly portrayed before him a terrible accident that might have been caused by the same infraction as his own. Perhaps for the first time he is fully conscious of the fact that his own violation could easily have snuffed out his own life, or the life of some other innocent person. The deep impression thus made is one he is not likely to forget.

In addition to traffic court, drivers are referred to the school by other agencies, all striving to achieve the same beneficial results. These agencies include the Board of Revocations, Juvenile court, and the Corporation Counsel's office which handles traffic prosecutions in the District of Columbia. The American Red Cross, aware of the worthwhile nature of the school and being vitally interested in traffic safety, instructs its drivers to attend, and many others prompted by the same motives enroll on a purely voluntary basis.

### The Court and the Traffic School

Because of the wide-spread interest in this school, and with the thought that other municipalities might be interested in setting up a traffic school as a potent force in combatting the ever-mounting accident toll, it might prove worthwhile to detail the mechanics of the school insofar as they relate to traffic court.

When a defendant who has been convicted of a traffic violation appears to be a cooperative person, whose clash with the law resulted perhaps from ignorance or momentary carelessness, he is referred by the court to the traffic school; and final disposition of his case is postponed for approximately one month. Attendance is purely voluntary on his part, and in most instances the student is eager to avail himself of the opportunity to attend the school when its purposes and functions are explained to him.

His case is then placed in the Probation department of the court, where the facts of his case and other pertinent information are re-

corded.[1] He is given a registration card,[2] authorizing him to attend school on the day or night of his choice, on successive Friday nights or Saturday mornings, for three two-hour sessions. He is instructed to report to the Probation department at the end of his period of

DATA PERTAINING TO TRAFFIC CASE NO. _____

Defendant: _____ Address: _____

Charge(s): _____

Facts of Accident or Offense — (Date) _____ (Time) _____ (Weather) _____

(Location) _____

(Speeds) _____

Officer: _____ (Pct) Corp. Counsel: _____

Witnesses: (1) _____ (3) _____

(2) _____ (4) _____

Property Damage — Defendant's Vehicle ($ ) _____ Other Vehicle ($ ) _____

Personal Injury: — Defendant's Vehicle _____ Other Vehicle - Pedestrian _____

Additional Data: _____

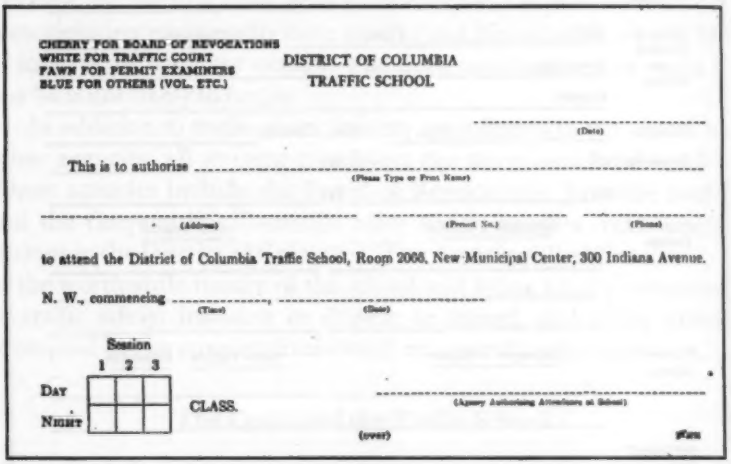
EXHIBIT A

instruction for final disposition of his case. The statement of facts in his case, together with the report from the traffic school[3] indicating the defendant's success or failure, are then submitted to the trial judge for his consideration, before final sentence is imposed.

As an incentive to serious and diligent study at the school, the judge at the outset indicates to the defendant that if he attends the school and successfully passes the final test[4]—a carefully planned and

1 Exhibit A
2 Exhibit B
3 Exhibit C
4 Exhibit D

comprehensive examination of the subject matter covered during the course—he will be given credit and this will be reflected in a reduction of any penalty which might otherwise have been imposed. The best evidence that students are grasping the fundamentals of the course is that of 1,258 traffic court referals to the school since its inception, 1,142 successfully passed the course with a grade of 70 or more.



CHERRY FOR BOARD OF REVOCATIONS
WHITE FOR TRAFFIC COURT
FAWN FOR PERMIT EXAMINERS
BLUE FOR OTHERS (VOL. ETC.)

DISTRICT OF COLUMBIA
TRAFFIC SCHOOL

(Date)

This is to authorize _____
(Please Type or Print Name)

_____ (Address) _____ (Permit No.) _____ (Phone)

to attend the District of Columbia Traffic School, Room 2006, New Municipal Center, 300 Indiana Avenue, N. W., commencing _____ (Time), _____ (Date)

Session
1 2 3
DAY
NIGHT
CLASS.

_____
(Agency Authorizing Attendance at School)

(over)

EXHIBIT B

It is interesting to note that the final session of the school is devoted to a lecture on the subjects of utmost importance to good driving practices but which too often are found wanting. These include the subjects of courtesy, attitude, and self-discipline. Obviously, if a person is to become a good and safe driver, he must bear these things in mind constantly and reflect them in his actions while driving. It is impossible to estimate the number of accidents caused simply by lack of courtesy or an indifferent attitude on the part of the operator. Every motorist should keep in mind that courtesy in operating a motor vehicle will prevent automobile accidents. The driver who is thoughtful enough to show proper regard and consideration for a fellow motorist is likely to be a careful driver. Of course, this pre-supposes that he has a thorough knowledge of traffic

rules and regulations and understands the mechanics of motor vehicle operation.

**DISTRICT OF COLUMBIA**
**TRAFFIC SCHOOL**

THIS IS TO CERTIFY THAT:

---

has successfully completed a course of Traffic Instruction conducted by the Metropolitan Police Department.

*Traffic Inspector.*
METROPOLITAN POLICE DEPARTMENT

EXHIBIT C

Unless good driving practices are developed at the outset, the minor offender sooner or later may become the major offender. When this happens, the court faces the serious responsibility of meting out adequate punishment to the killers and potential killers on the nation's highways. Although reason and common sense must govern the court in discharging its duty with respect to punishment, there is no room for leniency or compromise when dealing with serious and major traffic offenders. Circumstances may justify the court in extending a certain amount of "intelligent" leniency to a minor offender—one whose offense is not in the category of those causing accidents. On the other hand, the person who wilfully or thoughtlessly drives his vehicle recklessly, negligently, in a drunken condition, or at such a speed as to endanger life or property, has forfeited any claim he thinks he may have for sympathy from the court.

If there is to be a stop to this senseless highway slaughter, nothing less than a firm policy must be adopted and this means jailing the drunken, reckless, and hit-and-run driver. It is fairly easy for almost every traffic offender to pay a money fine, and thus there is no real deterrent. However, everyone abhors the thought of going to jail, and if a person knows he will go to jail if he jeopardizes the lives of

EXAMINATION
DISTRICT OF COLUMBIA TRAFFIC SCHOOL

NAME: _____ ADDRESS: _____

Mark an "X" in the Proper Box - - - - - Only One Answer is Correct.

1. You are approaching an intersection where a red traffic signal light is flashing on and off. You should:

   a. Come to a complete stop and then proceed with caution. ☐ a.
   b. Slow down and then proceed with caution. ☐ b.
   c. Blow your horn and continue on through the intersection. ☐ c

2. It is a violation to park within how many feet of an intersection? (Except on a one-way street):

   a. 40 feet. ☐ a.
   b. 50 feet. ☐ b.
   c. 60 feet. ☐ c.

3. If the traffic lights change to "GO" while pedestrians are still crossing the street at an intersection, the driver of a vehicle should:

   a. Wait until the pedestrians reach a point of safety. ☐ a.
   b. Sound the horn and drive carefully. ☐ b.
   c. Start moving as soon as the light changes to green. ☐ c.

4. In making a left turn a driver should give a proper signal, be in the lane nearest the center of the roadway and:

   a. Continue on and make your turn without regard for the other traffic. ☐ a.
   b. Pull to center of the street and wait for the light to change before turning. ☐ b.
   c. Give the right of way to vehicles within the intersection or approaching so closely as to create an immediate hazard. ☐ c.

5. You are driving in the same direction as a streetcar that has stopped to take on and let off passengers where there is no safety zone. You should:

   a. Blow your horn and proceed with caution. ☐ a.
   b. Come to a full stop not closer than 5 feet from the nearest exit of streetcar. ☐ b.
   c. Slow down and pass with caution. ☐ c.

6. What sort of a hand signal would you give to show another driver you intend to make a left turn?

   a. Arm up. ☐ a.
   b. Arm down. ☐ b.
   c. Arm straight out. ☐ c.

7. Why are vehicles required to slow down at all intersections?

   a. To make proper turns. ☐ a.
   b. To prevent accidents. ☐ b.
   c. To give other drivers the right of way. ☐ c.

8. When a pedestrian is crossing at an intersection on the proper signal or at an uncontrolled intersection, what must a driver making a turn do?

   a. Blow his horn and go on through. ☐ a.
   b. Give the pedestrian the right of way. ☐ b.
   c. Give a hand signal and proceed carefully. ☐ c.

9. When you come to an intersection where there is a stop sign, what must you do?

   a. Shift to a lower gear and proceed cautiously. ☐ a.
   b. Come to a complete stop. ☐ b.
   c. Give a hand signal, slow down and go on through. ☐ c.

10. In approaching an intersection you observe the roadway immediately beyond the intersection is obstructed by traffic. You should:

    a. Keep on driving but slow down. ☐ a.
    b. Stop in the intersection. ☐ b.
    c. Stop before entering the intersection. ☐ c.

(over)

EXHIBIT D

11. You are driving along a street at a proper rate of speed when you hear a vehicle sounding a siren approaching. You should:

a. Continue at the same rate of speed but pull to the right. ☐ a.
b. Slow down until the vehicle passes you. ☐ b.
c. Pull over to the right and stop. ☐ c.

12. When a driver injures a person with his car, what should he do?

a. Render assistance and call an ambulance. ☐ a.
b. Identify himself and then leave. ☐ b.
c. Help the injured person, identify himself and then report to the police immediately. ☐ c.

13. What is the most important thing to check when you drive a car for the first time?

a. The Headlights. ☐ a.
b. The Brakes. ☐ b.
c. The Gas Supply. ☐ c.

14. At an uncontrolled intersection, which of the following three vehicles has the right of way?

a. Vehicle approaching from the right. ☐ a.
b. Vehicle approaching from the left. ☐ b.
c. Vehicle within the intersection. ☐ c

15. Unless otherwise noted on an official sign, the legal rate of speed in the District of Columbia is:

a. 25 Miles per hour. ☐ a.
b. 30 Miles per hour. ☐ b.
c. 35 Miles per hour. ☐ c.

16. Usually the safest drivers are those who:

a. Drive the slowest. ☐ a.
b. Have the quickest reaction time. ☐ b.
c. Adjust their driving to existing conditions. ☐ c.

17. If you change your address, the regulations require you to notify the Director of Vehicles and Traffic within what period of time:

a. 72 Hours. ☐ a.
b. 5 Days. ☐ b.
c. 1 Week. ☐ c.

18. The speed limit when passing a school building or the grounds thereof during school recess or while children are going to or leaving school during the opening or closing hours is:

a. 10 Miles per hour. ☐ a.
b. 15 Miles per hour. ☐ b.
c. 25 Miles per hour. ☐ c.

19. Before crossing the sidewalk, what must a driver of a vehicle do when emerging from an alley or driveway?

a. Stop and Look. ☐ a.
b. Slow down and blow the horn. ☐ b.
c. Yield Right of Way to vehicles on right; then proceed. ☐ c.

20. Before the driver of a vehicle makes a turn, the regulations require him to:

a. Give a clear signal for the last 100 feet before turning. ☐ a.
b. Slow down and stop. ☐ b.
c. Keep his car under control and apply the brakes. ☐ c.

HAND PAPER IN TO THE INSTRUCTOR.

RETURN TO YOUR SEAT!!

(sk)

EXHIBIT D

his fellow-men through his own carelessness or irresponsibility in driving, then you have the real deterrent.

It is high time to take off the "kid glove" in dealing with this problem. If law enforcement agencies from coast to coast would adopt a vigorous program of jailing serious traffic offenders, the National Safety Council of Chicago would report a miraculous reduction in highway deaths and accidents next year. Therefore, a national slogan could be,

"In Traffic Safety There Is No Favorite—
Drunken, Reckless, Hit-and-Run Drivers Go To Jail"

If carried out, this would indeed be a refreshing change in policy, because the instances where drunken, reckless, and hit-and-run drivers are jailed are exceptions rather than the rule.

Of course, there is likely to be considerable opposition, on the part of the guilty, to jail sentences. Nevertheless, if all constitutional and legal rights of the defendant have been fully respected both before and during the trial, and the accused has been fairly and impartially tried and convicted on competent evidence, then the judge should have no hesitancy in meting out punishment to fit the crime. Certainly the defendant will have no just cause to complain if his rights have been zealously safeguarded. Society is exacting no more than is warranted for his reckless disregard of the life and property of his fellowman.

My experience in jailing major traffic offenders to cut down the tragic accident rate in the District of Columbia is a good example of the public backing one might expect in adopting a firm policy. The support from radio, press, civic organizations, and the public in general, in carrying out a fearless and firm policy of jailing major traffic offenders, was forceful evidence that the public wants safety and will go all out for safety, if assured that all phases of the problem are being handled intelligently, fairly, and vigorously. With public backing and support, no task is beyond the realm of accomplishment.

Individuals concerned with the important traffic program can find encouragement to carry forward the crusade to save human lives and material in furtherance of a strong America—the last outpost of democracy.

# Traffic Surveys for Indiana Cities

NORMAN F. SHAFER

*Mr. Shafer is director of the Department of Traffic of the State Highway Commission of Indiana. He has been employed for the last twenty-two years by the Highway Commission as Transitman, District Maintenance Engineer, District Engineer, Assistant State Engineer of Maintenance, State Engineer of Maintenance and Member of Commission. Mr. Shafer is a Civil Engineer and a Registered Professional Engineer in the State of Indiana.*

IN 1938, the Indiana General Assembly passed a law requiring the State Highway Commission to maintain, construct and reconstruct all city streets over which state highways were routed. The same law authorized the Commission to regulate and control all traffic using these streets. Engineering surveys were made to provide information for drafting resolutions enacted to establish parking regulations, loading zones, speed zones, etc.

In short, our traffic engineers temporarily became city traffic engineers because to establish intelligent traffic regulations on city streets designated as state highways, it was necessary to study traffic situations on adjacent city streets; otherwise our regulations would not have harmonized with those already in existence.

In 1939 a law required the Highway Commission to investigate all traffic control signals located on the routes of state highways through all cities and towns. If the Commission determined on the basis of a traffic engineering survey that any signal was not necessary for the safe, convenient, economical and orderly movement of traffic, such signal was removed and returned to the authority responsible for its erection. All signals found to be necessary for the safe, convenient, economical and orderly movement of traffic were approved by the Commission and remained in place.

Although many city officials did not agree with all of the regulations enacted by the Commission, they did learn that speed zones were established because of built-up conditions, that parking restrictions were a result of street width and that traffic regulations should be determined by basic engineering investigations.

The transition period in which the Commission took over state highways on city streets presented many problems, but it proved that two authorities can work in harmony and improve the flow of traffic by the uniform application of traffic engineering principles. The traffic engineering work done on these city streets clearly exposed the need for uniform traffic regulations on streets under jurisdiction of the local authorities.

By 1941 it was apparent that cities needed traffic engineering assistance in their local traffic problems. That year the Highway Commission authorized the Traffic Department to conduct a traffic engineering survey without cost to any city requesting such survey.

A comprehensive city traffic survey should include a study on legislation, enforcement and engineering. This was made possible by the cooperative efforts of the Safety Institute of Purdue, the National Automotive Theft Bureau and the Traffic Department of the State Highway Commission. The Traffic Enforcement section was conducted by the Safety Institute and the Theft Bureau, and Traffic Engineering by the Traffic Department. Results have shown this to be an ideal arrangement.

Many city officials were eager to improve traffic conditions in their cities and requested traffic surveys when this service was authorized by the Commission. Some of these officials were enthusiastic in their original desire to improve traffic conditions, but could not or would not enact the necessary legislation to carry out the recommendations and conclusions of the survey report. The survey group often found that much time and expense had been incurred in making a survey only to find that it would not be accepted. This lack of interest on the part of some officials resulted in the establishment of a definite survey procedure and policy.

## Survey Procedure and Policy

Survey of a city's traffic conditions is conducted upon the request of the mayor, chief of police and city officials, subject to the approval of the agencies that make up the survey group.

The actual conduct of the survey is on a step-by-step basis starting with traffic legislation. Following this, studies are made of police

traffic enforcement, traffic engineering and other factors which affect the traffic problem of the city.

As each part of the survey is completed, the studies and recommendations are submitted to city officials. Upon notification that the city is ready to take action on the completed section, the survey group proceeds with the preparation of the next section of the survey. In summary, the survey is conducted on a progressive basis in accordance with the agreement between city officials and the survey group. Each step in the survey procedure is a necessary and vital part of the city's overall traffic program and must be studied in the order enumerated above.

The time required to complete all parts of the survey depends in a large measure on the action of city officials in effecting the various recommendations as submitted.

The traffic engineering survey is conducted under the direct supervision of a traffic survey engineer. Necessary assistant traffic engineers and field men are assigned to secure and analyze the field data and assist in the compilation of the final survey report. Ten years' experience has developed definite survey methods, and it has proved that personal contact and an orderly method of procedure are necessary or the city may not enact the legislation required to carry out the conclusions and recommendations of the survey report.

Traffic surveys have been conducted in cities varying in population from 5,000 to 110,000 in all sections of the state. In general, similar traffic problems are found in each.

A typical survey was conducted in Bloomington, Indiana, a city of 21,000 population. A discussion of this survey will illustrate how it was conducted and what was included in the survey report.

### Traffic Legislation

The mayor and city council of Bloomington formally requested the Highway Commission to conduct a traffic survey in that city. The Commission acted favorably on the request and in due time the traffic survey engineer explained survey procedure and policy to the mayor. The value of a traffic commission as a public support group was discussed and the mayor appointed such a commission composed

of certain city officials and responsible representatives of organizations sincerely interested in traffic improvement.

The importance of a traffic commission cannot be overemphasized because the presence of such a commission makes traffic improvement and the initiation of necessary legislation a function of the people and not something that is being advocated by city officials alone. Actually, the commission provides a non-political, non-elective body that accepts reports, recommendations, listens to arguments of large and small groups of interested individuals and finally recommends action that should be taken by the elected officials.

Our records show that every traffic survey report has been accepted and the city has become traffic-improvement conscious when a traffic commission has been appointed. Conversely, survey reports have not been accepted when such a body has not been appointed and city officials have tried to assume and absorb all responsibility for public acceptance as well as enacting legislation to provide the necessary improvements.

The first step in the Bloomington survey was to present a model traffic ordinance to the mayor and city officials. This model ordinance is the same as that recommended by the National Committee on Uniform Traffic Laws, except that it has been corrected to comply with all Indiana laws. The city officials were asked to consider a complete revision of the city traffic ordinances and to bring them in complete conformity with the model ordinance. Assurance was given that this would be done and the next step of the survey was started.

## Traffic Engineering

To improve traffic conditions in any city a concerted effort must be made to determine the actual causes of the difficulty, find solutions to individual problems, and provide a means to use this information in the most effective manner.

A traffic engineering survey and a scientific analysis of the survey data are the basis for recommendations in all reports. Each factor of the over-all traffic problem is studied individually, steps for improvement determined and then modified to fit into coordinated recom-

mendations. These recommendations are consistent with procedures and standards accepted on a state and national basis.

*Preferential Streets.* The selection of preferential or through-streets was based on traffic volume, accident experience, origin and destination of traffic, physical characteristics and location with reference to other streets. The traffic volume during the major part of the day should average 300 cars an hour, or 450 cars an hour during peak hours. The use of accidents as a determinant of preference should be made only when such accidents cannot be reduced or eliminated by good and reasonable enforcement. Through-streets should be at least eight blocks long, except for short connecting streets that they join, and ordinarily should not be closer together than two thousand feet. Also a street should be declared preferential when at least one third of its intersections are controlled by traffic signals or stop signs.

A number of one- and two-hour traffic counts were taken in Bloomington and expanded to eight-hour totals by applying factors determined by twenty-four-hour automatic counts at five places in the city. The information gained from these counts was used not only to select preferential streets but for preferential intersections, one-way streets, and traffic signals.

An inventory of widths of the primary streets was presented in the appendix.

On the basis of the information obtained, a basic system of preferential streets was determined and shown graphically in the report.

*Preferential Intersections.* Facts considered in the selection of preferential intersections were volume, speed, accident experience, visibility, etc. All single intersections were studied and recommendations made for the preferentiality of intersections requiring this type of control.

*One-Way Streets.* City streets have two functions. The primary function is the movement of vehicles and the secondary function is the parking of vehicles. When a street is too narrow to accommodate both functions, and both are demanded, it is often necessary to com-

promise between the two. This compromise generally takes the form of one-way streets.

The advantages, disadvantages and specific need for one-way streets were discussed in the report. Bloomington is a city that has been developed by the "subdivider" and not by the "planner." The streets in each incorporated addition were designed according to the ideas of many subdividers; consequently, there were streets of all widths—mostly narrow—and many "T" intersections. Because of this it was possible to recommend only six one-way streets. A line map showing the proposed one-way streets and alleys was included in the report.

*Speed Zones.* The Uniform Traffic Code enacted by the 1939 Indiana General Assembly specifically defines and designates the speed in business and residence districts.

For uniform interpretation of this Act consistent with standards used elsewhere, the State Highway Commission has adopted the following procedure for determining speed zones in cities and towns:

"The speeds used in cities and towns shall be divided into three groups: 20 M.P.H., 30 M.P.H., 40 M.P.H. These speeds shall be applied so that a motorist entering a zoned town will come into a 40 mph zone first. Then, when conditions warrant, the speed will be reduced to 30 mph, and then if there is a closely built up business district, a 20 mph zone shall be established through it.

(1) 20 M.P.H. Zone. That part of a highway where at least 50 per cent of the frontage (including both sides of the street) for a distance of 500 feet or more, measured along the center line of the street, is occupied by buildings in use for business.

(2) 30 M.P.H. Zone. That part of a highway not including a 20 mph zone, where the total frontage on both sides of the street for a distance of 500 feet or more is occupied by residences or by residences and business buildings spaced under 100 feet apart. To determine such a zone, instead of measuring actual building frontage, divide the number of property front-feet by the number of houses within the block or half block.

(3) 40 M.P.H. Zone. That part of a highway, not covered by 20 mph and 30 mph zones where the total frontage on both sides of the

street for a distance of 700 feet or more is occupied by residences or residences and business buildings more than 100 feet apart and less than 300 feet apart. Determination to be made by same method as for 30 mph zones.

Twenty M.P.H. zones shall always be preceded by both 30 mph zones not less than 500 feet in length, and 40 mph zones not less than 700 feet in length.

For inbound traffic 30 mph zones must always be preceded by 40 mph zones not less than 700 feet in length. Forty mph zones, even if used alone, must be at least 700 feet in length.

Out-bound traffic should not be subject to the 40 mph restriction following a 30 mph zone, unless the area within its limits requires a 40 mph restriction as defined above."

The regulations have been found reasonable, satisfactory and consistent with national standards. They were written to meet certain conditions, and when thus applied, voluntary obedience has been good.

In Bloomington there were exceptions to this accepted speed zoning and these exceptions had not produced the desired results.

Traffic engineering investigations were made to determine the location of all 20, 30 and 40 miles an hour speed zones on all preferential streets. The specific location of each speed zone was recommended and listed in the survey report.

*Traffic Signals.* A general discussion of traffic signals and their use is included in the Bloomington report. Traffic signal warrants set out in the "Manual on Uniform Traffic Control Devices for Streets and Highways" published by the Bureau of Public Roads were discussed and explained. It was recommended that all city officials concerned with traffic regulations secure a copy of the Manual and use the warrants as a means of giving equitable consideration to all local requests for signals.

Traffic counts were made at all intersections where new signals were requested and at intersections where questionable signals were in place. All of these counts were shown in the appendix.

Engineering surveys revealed that one flashing beacon should be removed, one added and four new traffic signals should be installed.

*Traffic Signs.* The meaning of all signs and sign symbols was

explained and it was recommended that sign standards set out in the Manual of Uniform Traffic Control Devices for Streets and Highways be adopted, new or refinished signs be placed along preferential and one-way streets, all illegal commercial signs be removed and definite responsibility be assigned to erect and maintain all signs and that no violation of this procedure be tolerated.

*Street Markings.* Standards and methods of presenting traffic regulations by paint markings were discussed. It was recommended that these standards be followed and the marking of curbs be permitted only by the person assigned such authority.

*Street Lighting.* The value of proper street lighting is often overlooked. Lighting experts, working with traffic engineers, have developed standards for the satisfactory lighting of streets under all traffic conditions. This information was presented and it was recommended that Bloomington further improve its street lighting by using the given information as a guide to determine the amount of light needed on the streets and by using the traffic flow map to determine the location of the next equipment installed.

*Parking—General.* The first part of the report has dealt with the problems of Traffic Movement because they are the more important of the two. The report from now on will be devoted to the many problems of parking, and although somewhat less important, they are just as troublesome. The following four phases of the problem will be considered: 1. Restrictions and Manner; 2. Parking Time Limits; 3. Parking Meters; 4. Parking Lots.

*Parking Restrictions and Manner.* Experience has shown what space is actually needed for the free movement and satisfactory parking of cars upon the street. This space, converted into feet and measured at right angles to the curb or centerline, has been established and was included in a table for use.

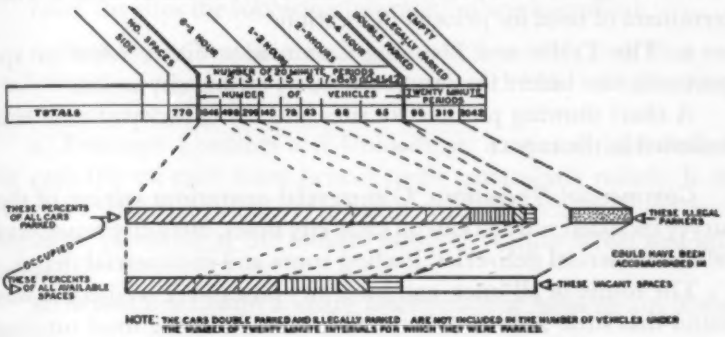
Minimum and preferred minimum standards under which the different types of parking could be effected on various width streets were established and explained.

Preferential and other streets were checked according to the standards that were established in the report and specific parking regulations were recommended for all streets in the city.

*Parking Time Limits.* Information which concerns the parking

facilities, parking habits and parking desires of those people who live in or visit Bloomington was collected and analyzed in a special parking study. On some streets the "Duration," or length of time parked, was given special attention, while on other streets the "Accumulation," or total amount of parking was studied. All of this information was included in tables in the appendix.

PARKING STUDY SUMMARY - LEGAL PARKERS




NOTE: THE CARS DOUBLE PARKED AND ILLEGALLY PARKED ARE NOT INCLUDED IN THE NUMBER OF VEHICLES UNDER THE NUMBER OF TWENTY MINUTE INTERVALS FOR WHICH THEY WERE PARKED.

Recommendations were made for the establishment of specific parking time limits on all streets when the survey showed such limits were needed.

*Parking Meters.* The parking meter and the parking meter law were discussed. Comments were presented concerning meter use in other cities but no recommendations were made for or against its installation.

*Parking Lots.* The survey showed off-street parking to be the key to the entire parking problem in Bloomington. This was determined after a complete study had been made of the on-street and off-street parking problem.

Theoretically, there would be no parking problem if those who attract or cause a demand for parking would provide sufficient off-street space to accommodate all who desire to park. Some Indiana cities have recently passed zoning ordinances which require that off-street parking and loading facilities be provided in or in connection with new buildings constructed for certain uses.

In the absence of such an ordinance, much can be accomplished by consultation of city officials with owners and their architects and engineers in the planning stage of new buildings or major construction, so that traffic and parking will be given due consideration in such plans.

The survey report recommended that:

1. Steps be taken to provide off-street parking lots for public use in Bloomington. Data presented in the report could be used as a determinant of need for priority of location.

2. The Traffic and Planning Commission either select or approve the sites before they are acquired by formal city action.

A chart showing possible lot sites and the capacity of each was included in the report.

*Commercial Operations.* Commercial operations section of the survey included sub-sections on inter-city buses, intra-city buses, taxi cabs, commercial deliveries, loading zones and commercial drives.

The routes of all inter- and intra-city buses were studied. It was found that little improvement could be made in the total turning movements and blocks travelled by inter-city buses within the city limits, but improvements could be made in the routing of the buses and such improvements were recommended.

An inspection of intra-city bus routes revealed four things:

1. All buses travelled their routes in a counter clockwise direction, thus making an excess number of left turns.

2. The routes were so correlated that one route could not be reversed without reversing all routes.

3. Each route was generally circular with buses outbound travelling on different streets from those used when travelling inbound to the business district.

4. A reversal of the routes should not be attempted without first knowing passenger loadings and riding distances on both directions.

To get this necessary information a thorough study of the bus operation was made on a day considered above average but not the day of maximum movement. In this study every person who rode a bus was checked as to route, intersection origin and destination,

and time of trip. The study was made during the hours between 6:00 A.M. and 6:00 P.M. and was conducted in the following manner.

Checkers on each bus had route slips with each intersection shown in proper location order. As each passenger entered the bus he was handed a slip which the checker had marked for that location. The passenger held the slip until he reached his destination, then returned it to the checker who marked it for that location. Time was also noted according to trip schedule.

From the slips the following information was assembled:

1. Passengers Carried: a. each trip on each route; b. each hour on each route; c. in 12 hours on each route; d. each hour on all routes; e. in 12 hours on all routes.

2. Passenger Loadings and Unloadings: a. at each intersection for each trip on each route (school traffic particularly noted); b. at each intersection for all trips for each route; c. at each intersection of duplicate routes; d. at the transfer point of Walnut Street and 5th Street.

3. Actual Bus Loads: a. at any intersection or point on any of the routes.

4. Actual Riding Distances: a. for each passenger on the present routes; b. for each passenger if the routes were reversed (special attention was given to students at grade and high schools).

The total information collected was too voluminous to incorporate in the report and was filed at the Bureau of Traffic, State Highway Commission of Indiana.

From the above study a table was prepared to show the actual differences in bus operations over routes that were in effect and bus operations over those that were proposed. The table showed that the proposed routes would effect the following total operational changes per day: 1. An increase of 572 right turns; 2. A decrease of 884 left turns; 3. A decrease of 780 blocks—65 miles of travel.

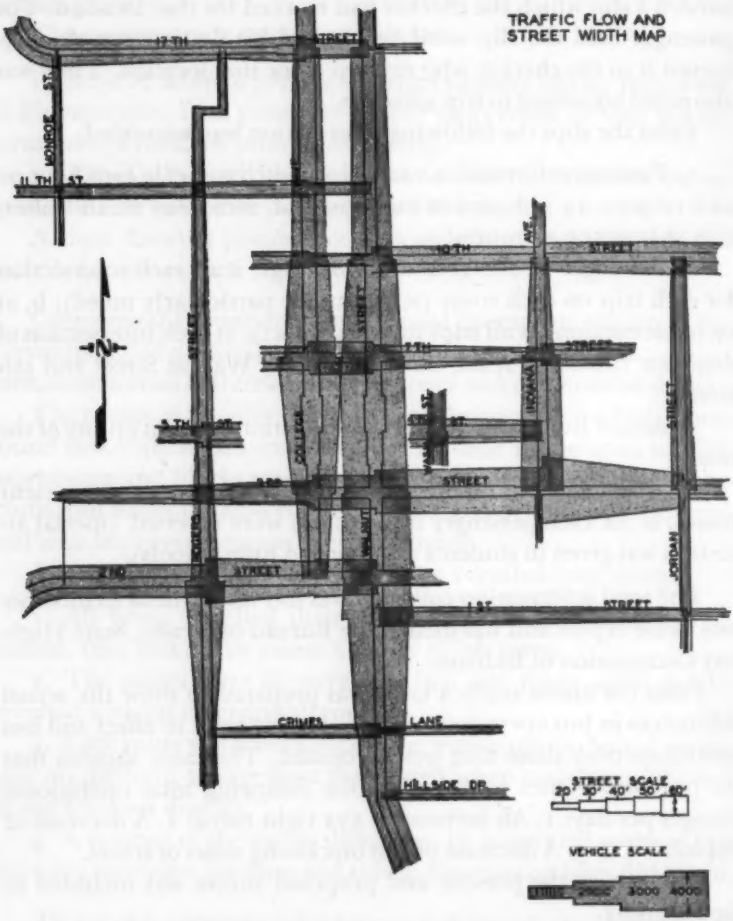
A sketch of the present and proposed routes was included in the appendix.

After a study of taxi cab use it was recommended that cab operations in Bloomington be regulated thus:

1. No private loading zones be given any company on streets

where time parking limits are necessary. Any loading zone so established should be a public zone.

2. Examination of equipment and drivers be undertaken as outlined in the report.




*Commercial Deliveries and Loading Zones.* The problem of commercial deliveries and loading zones is always controversial. One truck can deliver enough material to a store to supply the needs of

a thousand people who make individual automobile trips to the store for the material.

City traffic, in large part, is composed of these two elements of movement, and the prosperity of the many businesses is dependent upon the ease with which the movements can be made. Witness the moving of stores dealing in the basic necessities of living to outlying locations where more freedom of vehicular movement is possible.

As in every other phase of endeavor where people must work harmoniously together for their mutual benefit, it is very important that truck and automobile traffic be regulated in a manner that provides for the needs of each with due regard for the other. Consideration for trucks may mean a reduction of parking spaces for automobiles, while peak hour automobile traffic cannot be hindered by trucks used indiscriminately.

The following regulations have been given fair trial in many communities and are found to satisfy both truck and automobile traffic when justly applied:

1. All regular truck deliveries into the business district be made between 6:00 P.M. and 11:00 A.M.

2. Only emergency deliveries be allowed between 11:00 A.M. and 6:00 P.M. and then in trucks not to exceed ¾ ton capacity.

3. Trucks use alleys wherever possible in making deliveries, and the movements conform to the recommendations made in the section, "One Way Streets and Alleys."

4. Where alley deliveries cannot be made, loading zones be established in each block, preferably at alley entrances, to provide for such deliveries and all parking be strictly prohibited from the zones.

5. Double parking of delivery trucks be prohibited. The temporary parking of trucks in restricted zones at intersections is much less hazardous and congestive.

6. Police permission and supervision be secured by everyone who has need to restrict curb parking for the loading or unloading of large trucks.

7. Loading zones created by individuals who place obstructions or mark the streets to prohibit parking be eliminated and this practice be stopped.

A thorough explanation and discussion of these regulations at a meeting where all interests are represented will considerably reduce the effort necessary to place them in operation.

## Conclusion

This survey was requested for the purpose of finding what action could be taken to relieve congestion and promote orderly traffic movements on the streets of Bloomington. The findings and recommendations were presented in the foregoing sections.

Similar studies in other places have shown that most trouble is caused by the disregard of standard practices and procedures. Likewise, the correct application of those same standards can show a great immediate improvement at little cost in money or material.

The entire survey was made on this premise.

In no way should this report be considered the permanent solution to traffic problems in the city. It is intended as a summary of the minimum needs and a method of applying accepted standards to these needs.

Traffic control must be uniform in its application if local conditions are to be improved, and all cities must subscribe to similar methods before an overall improvement is possible.

The report is not self-actuating or enforcing. The energy of many people was needed to apply and carry out its provisions, while the cooperation of everyone was and will be needed to make these provisions work efficiently and effectively. Publicity and education are always very important in this respect.

Special assistance that was needed from any of the cooperating survey agencies was gladly furnished.

Local city officials and others were very cooperative. This cooperation was of material assistance in the completion of the survey report.

The actual Traffic Engineering Survey report contained 120 pages including an appendix. Also included were sketches showing parking standards, sketches of the Parking Study area, several line sketches pertaining to the Bus Route problem, sketches showing standards for signs, signals and paint marking, several sketches and

tables on the parking problem and a standard driveway permit form used by the State Highway Commission.

The completed Traffic Survey Report was presented to the Bloomington Traffic Commission and city officials in a public meeting. After studying and analyzing the report, a model traffic ordinance was passed embodying practically all of the recommendations included in the report. A study of traffic operations as they were before the survey was made and as they exist at the present time will prove that the survey, though engineering in nature, was practical in the results that were obtained.

We have shown in a brief manner how a City Traffic Survey was obtained by an Indiana city, how the survey was conducted, what was investigated, what was included in the Survey Report and finally what the city did with the report.

Many city traffic surveys have been completed since 1941, and it would be wrong to say that all survey report recommendations were warmly received by all members of the different Traffic Commissions and city officials. But the confidence created by personal contact and the untiring efforts of the survey group to explain why certain restrictions should be enacted as well as answer all questions submitted by interested groups, have yielded generous dividends in the form of improved traffic operations in numerous cities of the state.

Besides this, these surveys have done much to create favorable public relations between city officials and the Commission as attested by the numerous letters of thanks and commendation that have been received by the Commission.

# Use of a Transposed Traffic Flow for Highway Safety

J. J. JENKINS, JR.

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MODERN highway design is probably influenced more by criteria set up to provide safety for the motorist than by any other consideration. Certainly a major part of the cost of today's high speed roadway, perhaps best exemplified by the toll turnpike, is directly attributable to those features considered essential for safe travel by motor vehicles. Yet despite the vast sums that have been expended to eliminate traffic hazards the accident rates on the best-engineered roads of today are still alarmingly high.

In order to reduce the number of certain types of accidents known to be particularly prevalent on limited access dual highways it is proposed that the flow of traffic on such highways be transposed from the pattern now considered normal.

The proposed transposition of flow is best illustrated by the sketches shown in Figure 1. The upper sketch pictures a portion of any dual highway, assumed for purposes of illustration to be an east-west highway, on which normal flow patterns are shown. Vehicles are following the normal practice of driving in the right hand lane and passing in the left hand lane of each of the two roadways.

The lower sketch illustrates the same highway but with the flows transposed. East-bound traffic is in the north roadway instead of the south as now considered normal. West-bound traffic is similarly transposed. Note that the vehicles are still following the normal practice of driving in the right hand lane and passing in the left hand lane of each of the two roadways. *Thus transposed flow requires no change*

*in normal driving habits.* It has no relation whatever to the English pattern where traffic flows in the reverse of the American pattern. The concept is based simply on the premise that as far as a motorist on any one of a pair of parallel one-way roadways is concerned, the location of the second one-way roadway is immaterial, whether it be on his right or on his left.

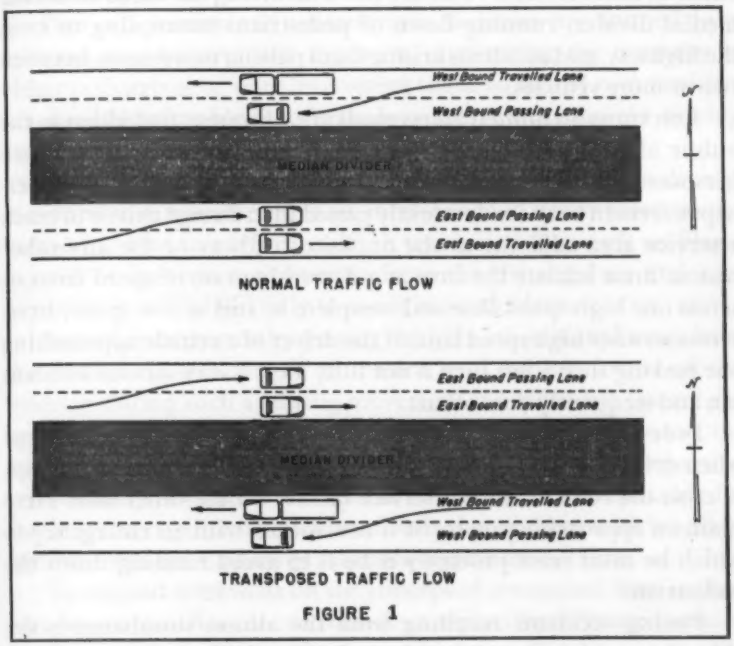



FIGURE 1

Before discussing the advantages of transposed flow over normal flow it would be well to examine some of the kinds of accident, and their causes, which are particularly prevalent on limited access highways designed for high speed traffic.

It has been observed that on such high speed highways, the ease of driving resulting from easy curves, flat grades, separated intersections and lack of traffic signals has a lulling, almost hypnotic, effect on some drivers. The resultant lowering of the reaction time can contribute heavily to accidents which might easily have been

avoided had the driver been able to maintain the degree of alertness usually required to meet the situations normally arising on ordinary highways.

### Prevalent Accident Types

The three types of accident especially prevalent although not peculiar to limited access roads are those involving left turns across the medial divider, running down of pedestrians attempting to cross the highway, and accidents arising from passing movements between two or more vehicles.

Left turns on limited access roads are, of course, forbidden to the public although frequently permitted to police and maintenance personnel. On normal flow roads the driver making a left turn, perhaps to return to an inadvertently passed interchange exit or to reach a service area adjacent to the opposite roadway or for any other reason, must initiate the turn at a decreasing rate of speed from or across one high speed lane and complete it, still at low speed, in or across another high speed lane. If the driver of a vehicle approaching one making such a left turn is not fully alert a very serious accident can and frequently does occur.

Pedestrian accidents on limited access highways usually occur when drivers park their vehicle on the side of the road and attempt to cross the road to reach a service facility on the other side. Here again an approaching motorist is confronted with an emergency to which he must react promptly if he is to avoid running down the pedestrian.

Passing accidents resulting from the almost simultaneous decision by two drivers to overtake and pass a third are a frequent occurrence and may be very severe. In many cases the second of the passing vehicles, unless the driver is fully alert, is forced off the road and into and possibly across the median divider. Should the vehicle actually cross the median divider, a head-on collision is likely to result usually with fatal results involving one or more completely innocent parties.

All the foregoing types of accidents have one thing in common. They involve unexpected occurrences that can result in serious accidents unless the driver is alert and reacts promptly.

How can transposed flow reduce the number of accidents of the types enumerated?

### Safety Features of Transposed Flow

Briefly, transposed flow roads have two inherent safety features not possessed by normal flow roads:

First, all service and maintenance facilities are located in a widened area between the roadways, eliminating the necessity of either pedestrians or vehicles crossing traffic lanes. *All such facilities are directly accessible to vehicles by a right turn from the driving lane of each roadway.*

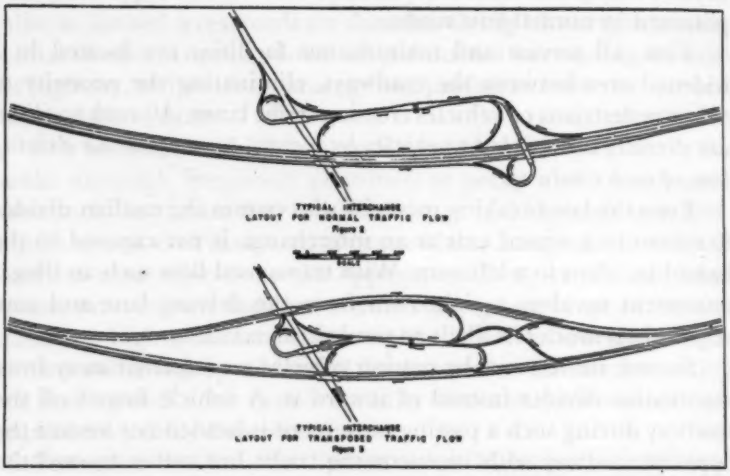
Even the law-breaking motorist who crosses the median divider to return to a missed exit at an interchange is not exposed to the hazard incident to a left turn. With transposed flow such an illegal movement involves a right turn from the driving lane and consequently is much less likely to result in an accident.

Second, movements by passing vehicles are initiated *away* from the median divider instead of toward it. A vehicle forced off the roadway during such a passing movement is headed not toward the opposite roadway with its oncoming traffic but rather toward the outside shoulder where the driver has a good chance of regaining control and avoiding an accident. Even though it is impossible for the driver to regain control it is unlikely that another vehicle will be involved and the chances of fatalities are reduced.

To expand somewhat on the concept of transposed flow as compared to normal flow, let us consider a typical interchange between a toll turnpike and a two-lane state highway. Figure 2 shows the usual arrangement for such an interchange where the flow on the turnpike is normal. Figure 3 illustrates how the same interchange would be laid out for a turnpike designed for transposed flow. Both are designed to pass all traffic through a single toll collection station.

No general statement can be made regarding the relative cost of the two interchanges because of the many factors that influence such costs. However, it should be noted the total deck area of the grade separation structures will probably be somewhat less for the transposed flow than for the normal flow layout. Moreover, while more

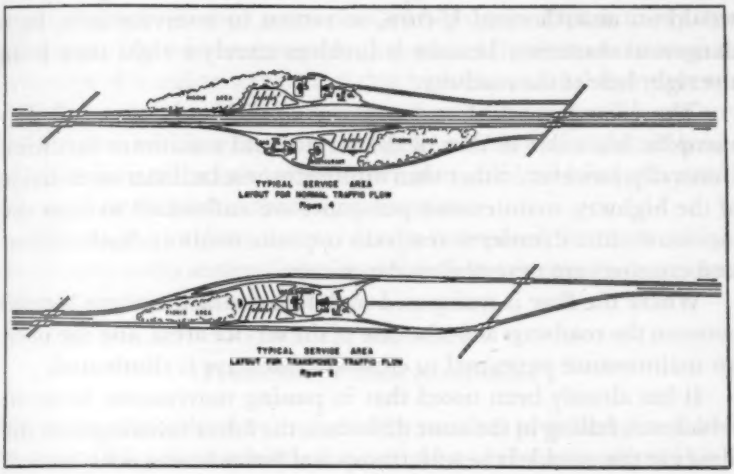
total acreage of land probably is required for right-of-way for the transposed flow layout, the normal flow interchange requires taking more land fronting on the state highway. In many instances this land would more than outweigh in value the additional back land required for the transposed flow interchange.




Functionally the two interchanges are similar, each providing for right hand movements off the highways and for the merging of traffic entering the highways with traffic in the right hand lanes of the highways. It should be repeated, however, that if a motorist on the turnpike inadvertantly misses an exit ramp and, in violation of regulations, makes a U-turn across the median to return to the interchange such a turn is a *right hand turn* from the driving lane when the flow is transposed and a *left hand turn* from the passing lane when the flow is normal.

Transposed flow offers a distinct advantage in the layout of service station and restaurant facilities which must be provided on toll turnpikes. Normal practice in the past has been to provide complete facilities for each of the dual roadways outside the limits of the highway. A typical arrangement of such facilities on a normal flow turnpike is shown in Figure 4. In some instances the dual facilities

indicated in Figure 4 are not provided at the same location but rather are staggered along the route so that at any given location service facilities are available for traffic on only one of the roadways. Under such an arrangement motorists will at times make left turns across the median divider to reach those facilities on the opposite



roadway. In other instances motorists will park their vehicles and walk across the highway to reach these facilities. Both of these practices are known to have been the cause of fatal accidents.

### Advantages of Transposed Flow

With transposed flow, service and restaurant facilities are located in a widened medial area between the two roadways. A typical arrangement is shown on Figure 5. The dual roadways are simply spread apart a sufficient distance to provide space enough for the required facilities; access to the area is by a normal right hand turn from either of the two roadways. Leaving the area the motorist returns to the highway by way of the conventional acceleration lane merging into the right hand lane of the roadway. Thus transposed flow permits serving both roadways with a single set of service facilities, ac-

cessible by a simple right turn from either roadway, whereas for normal flow duplicate facilities are necessary to serve the same purpose.

The economic advantages of transposed flow in this respect are obvious. From the standpoint of safety it will be seen that there is no incentive for a motorist to park and walk across the highway nor would an unauthorized U-turn, to return to a service area, be a dangerous maneuver because it involves merely a right turn from the right lane of the roadway.

The arrangement of maintenance facilities on a normal flow turnpike is similar to that of the service and restaurant facilities. Generally, however, rather than duplicate these facilities on each side of the highway, maintenance personnel are authorized to cross the median divider in order to reach the opposite roadway. Such authorized crossings are nevertheless dangerous.

Where the flow is transposed maintenance facilities are located between the roadways as in the case of the service areas, and the need for maintenance personnel to cross the roadways is eliminated.

It has already been noted that in passing movements, between vehicles travelling in the same direction, the faster vehicle passes the slower in the outside lane with transposed flow whereas, with normal flow, a similar movement forces the faster vehicle to the inside lanes adjacent to the median divider. This constitutes a fundamental difference between transposed and normal flow. Namely, with transposed flow the opposing lanes of fast moving traffic are separated by a greater distance than on a normal flow highway of the same width.

Referring to Figure 1, on a normal flow highway the high speed passing vehicles are separated only by the width of the median divider. Any sudden emergency which forces the driver of the high speed vehicle to pull off the roadway results in that vehicle's entering the median divider with the possibility of complete loss of control and a chance of its crossing over the median entirely and into the path of oncoming traffic on the opposite roadway. With transposed flow a vehicle forced off the road during a passing movement is directed to the outside of the roadway where a collision with another vehicle is extremely unlikely.

Stated in other terms, for a given width of pavement and median

divider, the transposition of flow results in a greater *effective* separation of opposing streams of traffic than would be afforded under normal patterns of flow. It follows that as far as the highway itself is concerned an increased margin of safety has been provided at *no additional cost whatsoever,* merely by transposing the flow of traffic.

It is, of course, obvious that transposed flow is restricted in its applicability to limited access divided highways. That is to say that as long as a motorist entering a highway has a freedom of choice as to direction of travel on any lane of that highway, normal flow patterns must be maintained. However, transposed flow is feasible on any highway on which access is controlled in such a way that it is impossible for a motorist to make a turn that will lead him onto a one-way roadway headed in the wrong direction.

The transition from normal flow to transposed flow on any highway is very easily accomplished by a simple crossover which requires a single grade separation structure.

## Problem of Public Acceptance

Since the principle of transposed flow was first proposed, less than a year ago, it has been subjected to critical study by a number of highway and traffic engineering and safety groups. In general the reaction has been favorable. The most frequently voiced criticism has to do with the question of public acceptance of the idea. This is of course a question that cannot be answered definitely until the public has had an opportunity to try it. It seems logical to suppose that the public will accept transposed flow as long as no confusion is created in motorists' minds as a result of it.

Certainly it is possible to furnish access facilities to a transposed flow highway so designed that a driver cannot make a mistake and find himself travelling in the wrong direction against traffic. Confusion in the mind of a motorist who feels he must have made a mistake and gotten on the wrong roadway, because of the unusual location of the other roadway in relation to the one he is travelling, could easily be cleared up by means of adequate signs indicating that he is indeed headed for his proper destination. The commonly used signs instructing the driver to keep to the right of the roadway and

to pass vehicles on the left would reassure the motorist as to the proper method of driving.

There are already in existence certain isolated locations in which traffic now follows a transposed flow pattern without giving rise to any difficulties. The author knows of one instance where two roadways, on which traffic flows in opposite directions, are carried through a single underpass in such a manner that the traffic is transposed from the normal pattern of flow. In this case the two opposing lanes are separated not by a median divider but by a single row of pipe posts. The arrangement works out satisfactorily and apparently does not confuse the motorists who use these roadways.

A common case in which traffic flows in transposed patterns exists on many dual highways flanked by service roads serving local traffic. In such instances a motorist is probably not even aware of the fact that vehicles are approaching him on a roadway to his right. Nevertheless the situation is entirely similar to the conditions that would exist under transposed flow. No doubt the reader will be able to recall other similar conditions where for all practical purposes transposed flow now exists.

Regarding the possibility that transposed flow may create confusion in the minds of motorists, it should be remembered that on present normal flow highways motorists encounter many situations in which they must rely on signs to follow the proper course to their desired destinations. A common example is the non-directional, cloverleaf interchange. It seems reasonable to assume that with properly designed signs any doubts that may arise in a driver's mind could easily be dispelled. Certainly a driver in doubt is an alerted driver and he can be expected to proceed with caution until he has reassured himself that his procedure is correct.

After extensive comparative cost studies involving several hundred miles of a specific toll turnpike, it was found that the design for normal flow was slightly more economical than that for transposed flow. This would suggest that for any highway there would be little difference in cost between a normal layout and a transposed flow layout. Conditions peculiar to any particular location might tip the balance one way or the other but any savings in either case are likely to be relatively small.

Summarizing briefly, transposed flow eliminates the cause of several common types of highway accidents, particularly those associated with illegal left turns and pedestrian crossings of the roadway. It will eliminate most of the serious head-on collisions associated with vehicles going out of control during a passing movement and crossing the medial divider. Finally, it makes for added safety by providing, for any given width of dual highway, greater effective distance between opposing lanes of high-speed vehicles.

In conclusion, it is hoped that highway and traffic engineers and others interested in highway safety will give serious consideration to transposed flow for future limited access dual highway construction as a means of reducing traffic accidents on such highways at little or no additional cost beyond that of the conventional highway designed for normal flow.

# The Effect of Roadside Features on Traffic Accidents

J. CARL MCMONAGLE

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MICHIGAN and the nation at large are experiencing a tremendous expansion of motor vehicle traffic. In Michigan, 1950 traffic exceeded by eight percent the state highway department's long-range estimate for that year. In 1951 actual travel was 16 percent above estimated. Currently we are producing more than 24 billion vehicle miles a year, or at about the rate our statisticians had forecast for 1964.

No one is able to predict with any certainty how long this expansion will continue at its present rate, but everyone knows that it is putting all highway agencies under heavy pressure. Construction forces, already faced by accumulated deficiencies, are straining to meet the most urgent of the mounting demands. Many states have expanded their maintenance operations to take up the slack left by their inability to replace old or inadequate facilities.

No group is more conscious of the critical conditions that are developing than the traffic engineers. Having the responsibility to operate traffic in whatever volumes it occurs over existing pavements and structures regardless of their adequacy, traffic engineers are keenly aware that hazards are increasing. In general, they are missing no opportunities to learn more about the basic facts of accident causation on which safety measures must be based.

### Fatality Rate Decreasing

Certain aspects of the highway safety picture are not too discouraging. The fatality rate has declined steadily during the last ten years and the trend has been downward for fourteen years. In Michigan

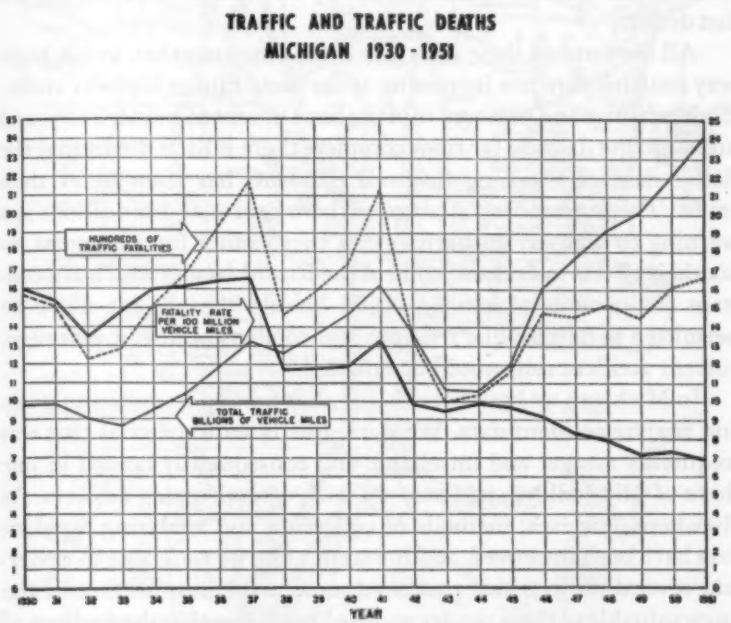
TRAFFIC AND TRAFFIC DEATHS
MICHIGAN 1930-1951
HUNDREDS OF TRAFFIC FATALITIES
FATALITY RATE PER 100 MILLION VEHICLE MILES
TOTAL TRAFFIC BILLIONS OF VEHICLE MILES
YEAR

FIGURE 1. Rapidly mounting traffic volumes combine with more gradually increasing traffic fatalities to produce a declining traffic death rate. Should the rate of 1937 again become operative, the rise in highway mortalities would be catastrophic.

the 1937 rate was over fifteen per 100 million vehicle miles; in 1951, it was less than seven per 100 million vehicle miles. I believe this is more or less representative of the experience in most of the country.

We should hesitate to assign too much credit for this condition to any particular measures or factors. Undoubtedly safety education and traffic engineering operations have contributed, but probably of greater importance are the lessons of care and conservation that home-front restrictions taught motorists during the war years. And

in this connection, one should not forget the progress of medical science, especially in the use of blood transfusion, which saved so many war-wounded from death and which undoubtedly has benefitted many traffic casualties similarly. However, in Michigan at least, any such influence is not reflected in a higher rate for traffic injuries; indeed, this rate has declined slightly but consistently during the last decade.

All the comfort these rates give is the assurance that, so far, highway casualties are not increasing at the same rate as highway traffic. Both fatalities and personal injuries have mounted numerically, and although the data are far from complete there is little doubt that the dollar damage resulting from all accidents has risen faster than traffic. The outstanding message of these figures and conditions is a warning to highway authorities that they cannot for a moment relax their efforts to find and control the hazard factors which are constant components of moving traffic. Should the present traffic be permitted to develop the frictions and conflicts of fifteen years ago, current accident tolls would be doubled.

In Michigan we have been on the alert for opportunities to study and analyze accident data. We started early with material that was frequently meager and unreliable and consequently landed in our share of blind alleys and came up with several wrong answers. As elsewhere, however, methods of collecting and analyzing accident data have been improved, and in recent years we were able to undertake several projects that produced some usable results. One of the more valuable of these results was the knowledge that the findings of such projects are strictly limited as to scope and application by the method of investigation.

## Two Methods of Accident Study

There are two ways of approaching the problems of highway accidents. The first is to make an intensive study of the characteristics of an individual accident or of a series of accidents in an individual location in relation to attendant circumstances or features. This is the approach of the enforcement officer investigating a crash for the purpose of setting up an official record and possibly of assessing re-

sponsibility. It is also the approach of the traffic engineer studying a high-accident location to find causes and devise remedial measures.

FIGURE 2. The study road is a 60-mile section of the interstate route leading from Toledo to Detroit and other Michigan industrial centers. Part of it was built as a by-pass around the Detroit metropolitan area, but roadside business development has transformed considerable sections into busy suburban shopping districts.

It is an accepted fact that even such intensive investigations fall far short of getting all the elements of the accident situation under study; deep psychological factors are seldom touched and factors closer to the observable surface are frequently missed. Nevertheless, such studies produce answers that are usually sufficient for their

immediate purposes. The results of a series of such studies may provide the material for analyses which will give solutions of wider scope. However, the greater the number of such individual studies, the more general are the conclusions that can be drawn from their accumulated findings.

The second way of approaching accident problems is much more objective. It consists of taking as large a collection of accident data as possible, and analyzing them in their entirety in relation to selected conditions or features whose relationship to accident occurrence is to be investigated. The validity of the method rests on the belief that the distribution of a large number of instances will create an informative pattern.

The findings of studies of this kind are usually very general in character. This is bound to be the case because, although a large number of accidents is used in the analysis, by the nature of the study only those characteristics become significant which are more than ordinarily prevalent.

## Purpose of Michigan Study

The study reported here is of the latter type. It has resulted in some very general findings about certain basic elements of the accident situations that have developed on highways traversing suburban areas. In most cases these findings are really substantiations of conclusions which previously had been reached tentatively on the basis of rather casual observation of conditions.

The Michigan Study of roadside features as elements in the accident picture grew out of a program initiated in 1945 by the National Safety Council, with the support of the Bureau of Public Roads. The Council asked the cooperation of the state highway agencies in making a comparative analysis of accidents that occurred in 1941 on interstate highways. The accidents were to be analyzed in relation to highway types and certain design features.

Michigan cooperated in this program although we were pretty firmly convinced that the accident data then available lacked the detail and accuracy to make such a study successful. We then set up a program for studying accidents in relation to roadside as well as

roadway features, and devised methods for obtaining data which would be sufficiently accurate to permit detailed analysis. We were able to secure the participation of the Bureau of Public Roads in carrying out this program.

The purpose was to record and study a limited number of the conditions under which accidents took place and to determine, if possible, the relative importance of individual types of features in creating hazards for traffic. Aside from the findings, the most interesting phases of the project are the means adopted to secure sound, detailed data, and the statistical methods employed to analyze these data.

Of primary importance were the plans devised to make certain that all data should be accurate and particularly that the location of both accidents and features should be precisely established. These plans provided for the selection of a study road and for improved accident reporting measures.

### Study Road and Reporting Methods

A 70-mile stretch of highway on US-24 from the Ohio state line to M-58 just south of Pontiac, and on M-58 to its intersection with US-10, was selected as the study road. This route includes a considerable mileage of purely rural highway, but since it skirts the west edge of the Detroit metropolitan area, it is principally a suburban highway with much roadside development, some of it extremely dense. For the purposes of this study, the portions of the route in urban territory were deleted.

To facilitate the exact location of features and accidents, the route was divided into 1000-foot sections each designated by a numbered marker. All road and roadside features were then inventoried and their location described with reference to these markers. Agreements next were reached with police agencies under which state police troopers, local policemen and sheriffs' officers would include in the report of every accident the precise place of its occurrence as indicated by the distance from the nearest of these markers.

These arrangements were completed during 1946; reporting accidents in accordance with the prescribed methods began on the

first day of 1947 and is still in progress. By the end of 1949, 3025 accidents had been reported. These are the accidents used in most of the analyses in this study, although in earlier phases of the study only the 1968 accidents which occurred in 1947 and 1948 were used.

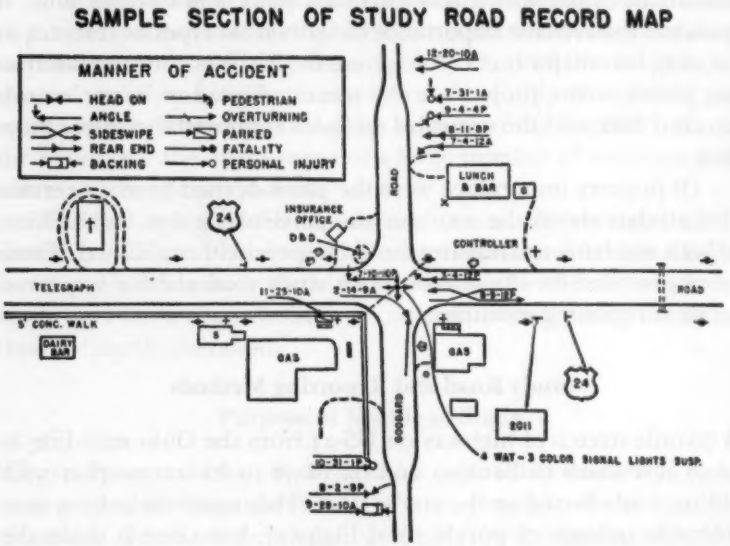


FIGURE 3. All data regarding road and roadside features, traffic volumes, and accident occurrence were recorded on a detailed strip map for reference and study.

## Methods of Analysis

All data—design and roadside features and accidents—were first inscribed on a strip map of the study road, but this was merely for recording purposes. For analysis, accident data were punched on two different tabulating card forms. Of the first form, one card was punched for each accident and carried items regarding its distance in hundreds of feet from various features, 1948 average daily traffic, etc. Of the second card form, one was punched for each section and included the section number, the number of accidents, the number of features of each kind, the daily traffic, and the section length.

Two statistical methods were used in analyzing the data. The first method consisted of tabulating frequency distribution of accidents according to their distance from each specified type of feature.

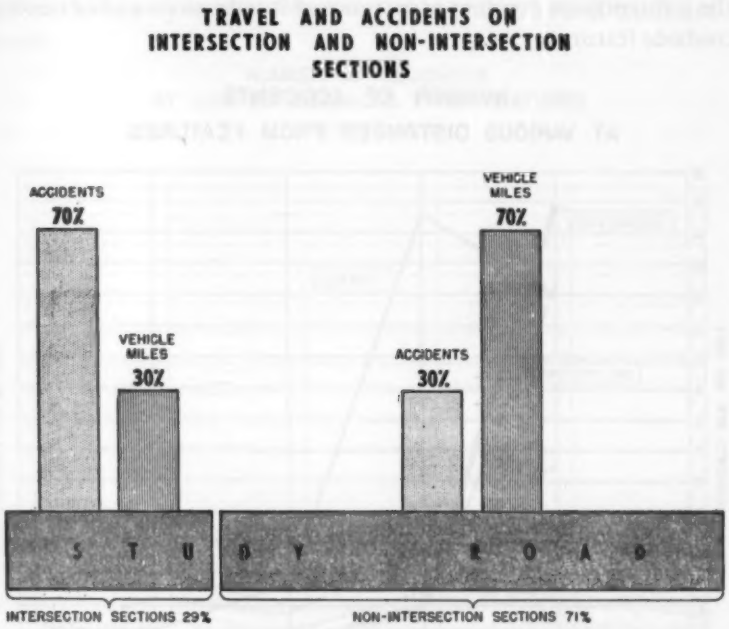


FIGURE 4. Traffic was about evenly divided between the intersection sections and the non-intersection sections, but accident occurrence was heavily concentrated where intersections and roadside features combined to create traffic hazards.

Accumulative percentages of the accidents within various distances were computed for each feature and rate curves were drawn.

The second method consisted of calculating correlation coefficients between the number of accidents and the number of various design and roadside features as they occurred in the several sections into which the study road was divided for analytical purposes.

It should be noted that the 1000-foot road sections were used only for locating features and accidents; initial phases of the study demonstrated that these sections were unsuitable bases for analyzing

the data. For the latter purpose, the road was divided into two kinds of section—intersection sections, which include one or more major intersections; and non-intersection sections, which include no intersections. This was done to permit a clearer discrimination between the influences on accident occurrence of intersections and of nearby roadside features.

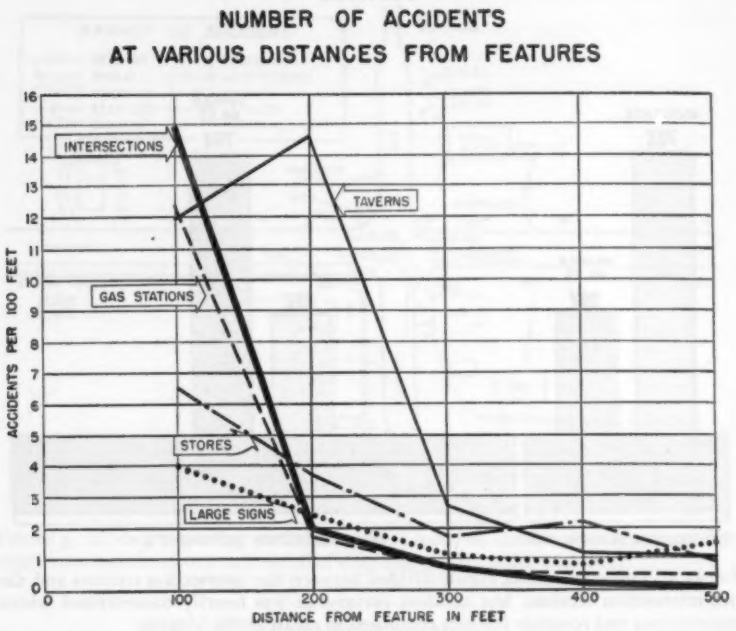


FIGURE 5. The intersections themselves are the major item in this graph of accident occurrence in the intersection sections. Accidents show a tendency to cluster around other features, but it is a question how much their indicated association with accidents is due to their location relative to major intersections.

## Results of the Study

Analysis of the data by the method of frequency distribution turned up some interesting relationships. One of the most striking of these is revealed by a comparison of the results of separate computations of the data for intersection and non-intersection sections. It shows that

while the intersection sections account for less than one-third of the study road and its traffic, they produce 70 per cent of total accidents. Their accident rate is 8.88 per million vehicle miles while the rate on the non-intersection sections is only 1.6 accidents per million vehicle miles, or just about the rate on Michigan's rural trunkline system.

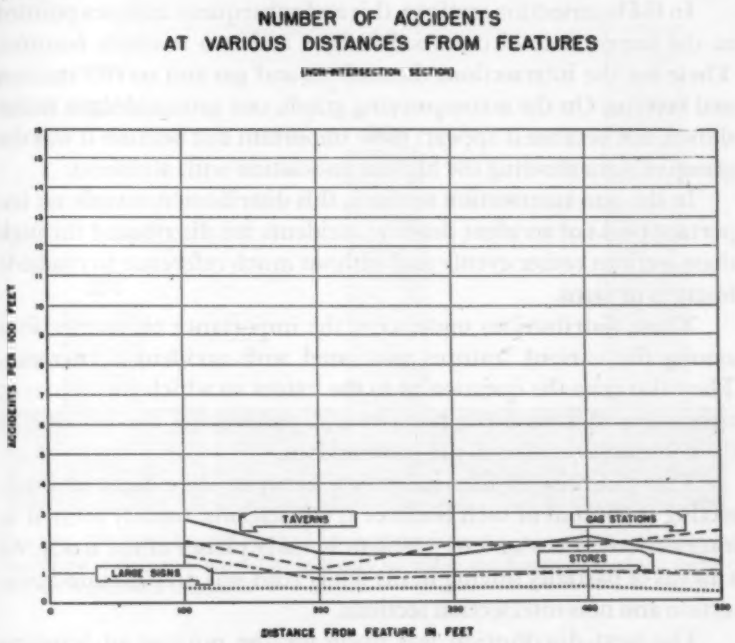


FIGURE 6. In non-intersection sections, accidents appear to be somewhat evenly distributed without much significant reference to the roadside features.

This wide difference in the accident experience in these two kinds of section undoubtedly reflects the distribution of features between them. The non-intersection sections have only two intersections. By contrast the intersection sections have all the major intersections while the density of roadside features is 3.6 times that in the non-intersection sections. These distributions are due to the marked preference of roadside business for locations at or near principal intersections.

Another type of frequency distribution groups the accidents by density at successive distances from several types of features. Association of a feature with accident occurrence is indicated by the degree of accident density found in its immediate vicinity. In all cases where a feature appears to have real significance, accident density tapers off rapidly at a distance of 100 or 200 feet.

In the intersection sections, this and subsequent analyses pointed to the importance of one road feature and two roadside features. These are the intersections themselves, and gas and service stations and taverns. On the accompanying graph, one group of signs is also shown, not because it appears to be important but because it was the group of signs showing the highest association with accidents.

In the non-intersection sections, this distribution reveals no important peaks of accident density; accidents are distributed through these sections rather evenly and without much reference to roadside features or signs.

These distributions underscore the importance of intersections among the various features associated with accident occurrence. They also raise the question as to the extent to which the apparent association of some other features is dependent on the location of these features relative to the intersections.

This difficulty of discriminating between the effects of intersecting traffic and of such features as gas stations, usually located at intersections, was a serious problem in early phases of the study. As a means of partially solving it, the study road was divided into intersection and non-intersection sections.

The next distribution was made for the purpose of learning something of the relative importance of intersections and other features. The pertinent data for intersection sections were tabulated with the sections grouped according to the density of roadside features. The results go a long way toward providing an answer.

On 28 per cent of the mileage in these sections there were forty-six intersections but no roadside features. On this mileage the accident rate was 3.74 per million vehicle miles.

Fifty per cent of the road length had up to four roadside features per 1000 feet; it had an accident rate of 9.06.

On 22 per cent of the mileage, roadside features averaged more

than four features per 1000 feet and the accident rate was 13.48 accidents per million vehicle miles.

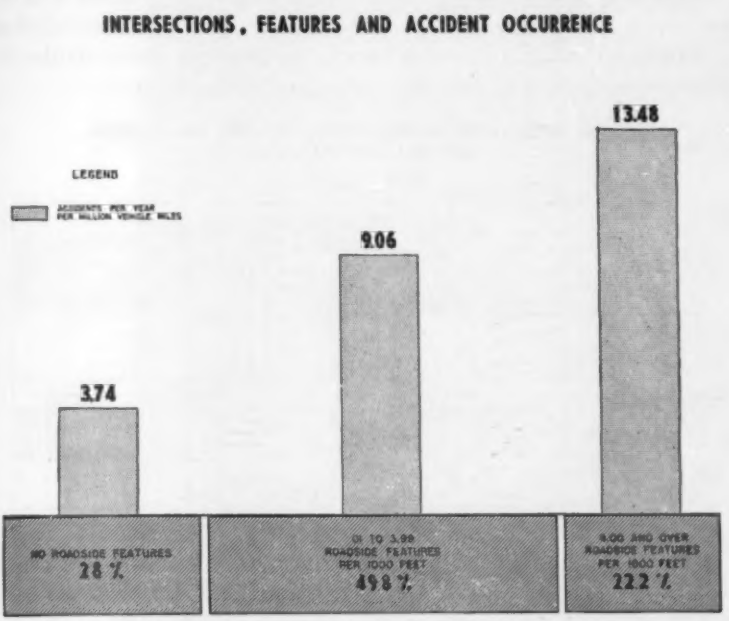


FIGURE 7. This graph indicates the high accident potential of intersections, but it also shows how steeply accident occurrence goes up where the density of roadside features in these locations is increased.

These figures show that intersections are hazardous in themselves since the rate of 3.74 in the group with no roadside features is more than double the rate for non-intersection sections. But the rising accident rates in the other two groups indicate that intersections become much more hazardous as roadside features are built around them.

The second method of analyzing the data in this study was by determining the degree of correlation between accidents and various design and roadside features, and was accomplished by computing correlation coefficients. These are measures of the amount of association between one variable and one or more other variable. The

degree of association is registered on a scale running from — 1 to + 1. If two variables are perfectly associated—that is, if one varies directly and proportionately as the other—their correlation will be exactly + 1, or, if one varies inversely as the other, their correlation will be exactly — 1. If there is association between two variables, it is measured by how close their coefficient approaches + 1.

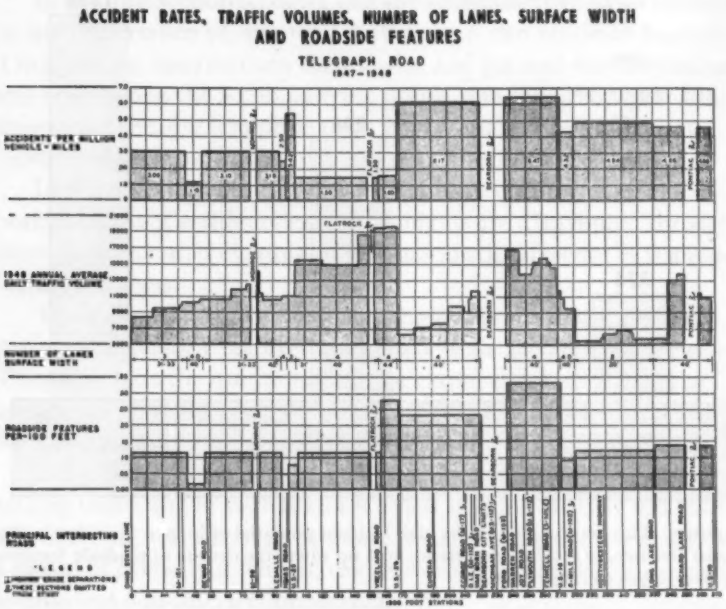
ACCIDENT RATES, TRAFFIC VOLUMES, NUMBER OF LANES, SURFACE WIDTH AND ROADSIDE FEATURES
TELEGRAPH ROAD
1947–1948
ACCIDENTS PER MILLION VEHICLE - MILES
1948 ANNUAL AVERAGE DAILY TRAFFIC VOLUME
NUMBER OF LANES SURFACE WIDTH
ROADSIDE FEATURES PER 100 FEET
PRINCIPAL INTERSECTING ROAD
LEGEND
1000 FOOT STATIONS

FIGURE 8. This strip graph of the study road shows the distribution of the factors involved in accident occurrence. The coincidence of roadside features and traffic with accident rates, while not perfect, is significant.

This method was used to determine the association of accidents with features in both intersection and non-intersection sections, but since significant degrees of correlation were found only in the intersection sections, these are shown on the accompanying chart. It will be noted that Other Establishments, Advertising Signs, Taverns, and Gas Stations all produce coefficients above .600.

It was recognized that in many of these cases, the indicated degree of association of a feature with accidents might be, in reality, a re-

flection of the degrees of association among the features themselves. In other words, certain of these correlation coefficients may well include not only the association of an individual feature with accidents but the association with accidents of other nearby features. For this reason it was desirable and necessary to segregate the association of each individual feature from the influence of other features.

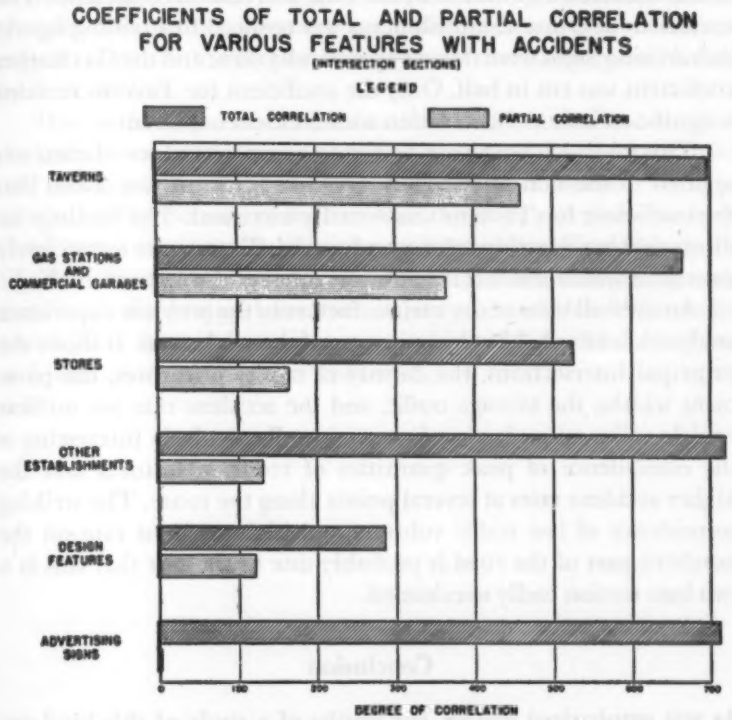


FIGURE 9. This graph shows the striking contrast between the results when accidents and features were correlated by ordinary methods and when partial correlation was employed to segregate the influence of each individual type of feature. It reveals how complex are the inter-relations of varied road and roadside conditions in their effect on traffic operation.

This was accomplished by what the statisticians call partial correlation. That is a process by which the correlation of two variables is computed with the effect of other associated variables eliminated or

held constant. To put it in another way, partial correlation measures the effect of one variable in its own right upon a second variable independently of the effect of third or fourth variables which may be present in the field of study.

As the chart indicates, when partial correlation was applied to the features in the intersection sections, radical changes were made in the association indicated by the total correlation coefficients. The coefficient of Other Establishments was reduced to a trifling figure; Advertising Signs went down to practically zero; and the Gas Station coefficient was cut in half. Only the coefficient for Taverns remains a significant index of association with accident occurrence.

This finding is borne out by results when partial correlation was applied to the non-intersection sections. There, it was found that the coefficient for Taverns was actually increased. The findings indicate that in all sections of the study route, Taverns are more closely associated with accidents than are any other of the features studied.

An over-all view of the various factors in the accident experience analyzed, is afforded by the strip map of the study road. It shows the principal intersections, the density of roadside features, the pavement widths, the average traffic, and the accident rate per million vehicle miles on each 1000-foot section. Particularly interesting is the coincidence of peak quantities of roadside features and the higher accident rates at several points along the route. The striking coincidence of law traffic volumes and high accident rate on the northern part of the road is probably due to the fact that this is a two-lane section badly overloaded.

## Conclusion

As was emphasized earlier, the results of a study of this kind are bound to be of a very general nature. They indicate that intersections are themselves centers of traffic hazard and that when the complexities of traffic movement at these points are further complicated by roadside commercial developments, the hazards increase.

These are findings which have importance in basic problems of highway planning and traffic operation. They point to the fact that every effort should be made to provide in suburban areas highways

which will protect the main streams of traffic from interference from the roadside. They indicate that intersections in particular require protection.

The studies point with some precision to the relative importance of various features as factors in creating conditions in which accidents occur with greater than what we believe is normal frequency.

As has been pointed out, most of these findings substantiate conclusions that had been reached but hitherto lacked clear statistical support. The validity of these conclusions is now soundly established by these studies.

Due to the importance of the matters with which these analyses deal, we at one time planned to double the length of our study road and to extend the scope of our investigations. However, we have concluded that because of the nature of the study and of the methods employed, a continuation of its operation would merely add supporting data to conclusions that have already been adequately substantiated; the project has served its purpose and should be terminated. This, then, is the final report on this study of roadside features and their effect on accident experience.

# The Uses of Scale Models

LEONARD N. ABRAMS

*Mr. Abrams is a partner with his father in Panoramic Studies in Philadelphia. He served three years in an Army model-making unit overseas. This experience was supplemented by reading, observation, and contact with professional model-makers in the United States, England and France. He entered the Panoramic Studies firm immediately after the war. The company has handled architectural and city planning projects for the last seven years.*

ALTHOUGH the craft of model-making is as old as architecture itself, the constructive use of scale models is still the exception rather than the rule. This article will point out a few of the generally unrealized potential values that apply with particular force to highway problems.

Most models are made for one of two major purposes: public presentation, or engineering. This cleavage may, in itself, be symptomatic of the excessive specialization so prevalent in modern technology. Most scale models, when built for exhibition, are commenced after the greater part of the planning work has been committed to blueprint form.

Once completed, the reactions of the planners themselves, not to mention the comments of the public, cause various revisions to the model. New sections may be patched on from time to time. The model is shown to the public as long as a specific project is of some interest, then it is put in storage or demolished. This is useful to some degree but is neither economical nor consistent in its result.

Those few models for use in engineering studies, while accurate as to the facts, are not usually of craftmanship or artistry suitable for public display. Here too, only a fraction of the potential value is realized.

There are two characteristic objections to the use of scale models: that they are not necessary in the first place, and that they are too costly. The same objections have been (and are still) raised to most planners and planning activities! The answer is similar in both cases:

Models, like plans, are both necessary and economical *if* intelligent use is made of them.

There are three major phases to the comprehensive use of scale models.

**"Before" (Or now)**

The time to make a model is at the start of the project, for the study of existing conditions. Up to World War II, maps were thought to be sufficient for understanding any terrain problem. But the time required, under pressure, to read maps and aerial photographs had to be cut. The expensive brain power represented by the professional mind was needed for bigger tasks than sorting out a lot of contour lines.

Scale models were used extensively, for planning and for briefing. Their superiority to maps and aerial photographs led one general to remark that one man in a model shop was worth a hundred men on the line.

Even if direct examination of the terrain had been possible, the operations were too large to be seen in their entirety. The savings in lives, time and money realized by this military device led to speculation as to whether scale models might help to reduce our civilian casualty rate on the highways.

Studies immediately after the war indicated no practical limits on the accuracy of scale models. Present-day methods accept tolerances of .005 of an inch on terrain work. This standard was not applied indiscriminately: a high degree of simplification was found good in the first study phases. This applies with special force to the treatment of contours; these should be left unmodeled so as to provide planes of reference for engineering measurements.

Figure No. 1 shows a preliminary study model in which highly generalized highways, contours, and building forms were used.

One of the most elaborate studies of existing urban conditions to be made in miniature was the Downtown Philadelphia model, originally built for the Better Philadelphia Exhibitions. The model, at a scale one inch representing fifty feet, covers 440 square feet. All existing conditions are shown, with a series of revolving panels demonstrating proposed improvements on their reverse sides. In Figure

No. 2, we see a small segment of the model, with all of the existing street pattern accurately indicated, together with the buildings, the latter substantially as shown in the Sanborn maps.

### "And After"

Compare Figures No. 2 and No. 3. They represent the same area as re-studied on the scale model. A major street has been added (Pennsylvania Boulevard) and the diagonal (Woodland Avenue) that creates one of the city's worst intersections has been removed. This change in the traffic pattern facilitates the redevelopment of the area in larger blocks, eliminating the maintenance of several small streets. All of this is by way of illustrating the second major phase of the use of scale models: the study of proposed projects.

The Schuylkill Expressway model (scale 1 inch = 100 feet) shows many of the study possibilities. Can you imagine reading the drawings of that complex intersection (Figure No. 4) superimposed on the existing terrain? And the addition of the apartments and shopping center (Figure No. 5) posed a fresh set of problems, all of which were tested on the model. Studies were made regarding an overpass to reach the shopping center, on possible changes in grade and widening of City Line Avenue, on the relationship of the access roads to the overpass, on the effects of the shopping center on properties to the north of City Line Avenue, the sight lines for entrances and exits . . . every one of these problems was studied directly on the scale model.

Moving down the Expressway to its junction with the Roosevelt Boulevard Extension, the terrain presented fresh problems (Figure No. 6.) Two prominent knobs must be cut through, with a deep railway cut to be considered. Could the cuts be daylighted to allow for good vision, for snow melting, etc., or would a short tunnel be feasible? What about the curves and gradient, the railroad clearances and easements? Again . . . "try it on the model!" (Figure No. 7.)

The Boulevard Extension model eventually grew to some twenty feet in length. There was a storm of opposition in the affected neighborhoods, for some of the structure was to be overhead as a viaduct, part to be carried as a depressed highway. The appearance of these

features had to be shown, tests could be made to show just where the cast shadows would fall, to show whose property had to be taken and why, whose street would be realigned, or dead-ended, or widened. And you can imagine the shout when it was discovered that a portion of the new highway cut through a corner of a park, until it was demonstrated on the model that a neat use of terrain ensured that they'd scarcely be able to see the highway at all!

Still further down the Expressway, the Downtown Model was revised to include the new plan. Once again, many three-dimensional studies were made, first in crude sketch form, later in more detail. (Figure No. 8). The location of the new bridge at Vine Street posed an exceptionally difficult planning problem, the intersection being limited by the railroad yards on one side and the river on the other. The feasibility of bridging the railyards had to be studied.

From all of this emerges the concept of the model as a genuine engineering tool. In some cases this has been carried into the physical testing field, as in the example of the wind tunnel studies made for the bridge at Tacoma, Washington. In such cases, the scale model duplicates stresses and modes of motion so that safety can be achieved without over-building.

Movable bridges also fall into the category of useful working models, especially in the consideration of several alternate types. The problems of clearance, engineering features, and appearance in context, can be studied, compared and evaluated.

## The Big Show

Now the same model, used for study of existing, then proposed conditions, becomes a presentation model. We take it for granted that most people cannot read blueprints, profiles, and similar highway drawings; a great many people also have a strong distrust of renderings, or, as the newspapers term them, "artist impressions of the new highway." And yet people do accept a scale model. Perhaps it is the disarming effect that the charm of the miniature always has for us.

More likely, the model is accepted almost as a *fait accompli* simply because it is a concrete thing in three-dimensions. Most im-

portant, it reveals the whole story as a single concept, understandable to the non-technical viewer. The techniques of presentation models can capitalize on these psychological factors, but carefully. The details used to secure realism must be serious and discreet. Critical neighborhood groups will be quick to label any sort of caricature as propaganda tricks. Detail can be used selectively, to dramatize and emphasize a point. In the illustrations, note that the cars have been placed to help show the flow of traffic through the intersections, the uncrowded movement on the highway. There are traffic jams on the Downtown Model too—where the streets aren't well planned, of course!

Color is another highly selective tool. On the Downtown Model, subtle differences in the color range pointed up the fact that the plan worked toward construction of highways on all four sides of the area's perimeter.

Landscaping, so often a matter of concern or interest to organized groups, can be illustrated on a scale model. The suppression of unsightly views, the preservation of scenic beauties, and the integration of structural highway features can all be shown in a vivid and colorful manner best calculated to arouse public interest and support.

Exhibition of a model is an ideal time to listen in on public reaction. Also, one well-informed person, stationed at the model to answer questions can do more for public understanding of highway planning than innumerable glossy photos and press releases.

It is not the purpose of this article to deal with the subject of model-making as such. The basic techniques of execution are relatively simple, if a reasonable amount of craftsmanship and imagination are to be had. However, there are several points connected with the foregoing discussion which do affect the construction techniques and are worthy of brief mention.

Planners should be consistent . . . (a) *Models must be planned.* Yes, like the highways, bridges, and cities they represent, models must be planned. They must be revised (many times if necessary), stored and transported in an efficient and economical way. Recent tests with small modular panels indicate the feasibility of model sets that can be stacked on each other or in simple racks, can be used at a

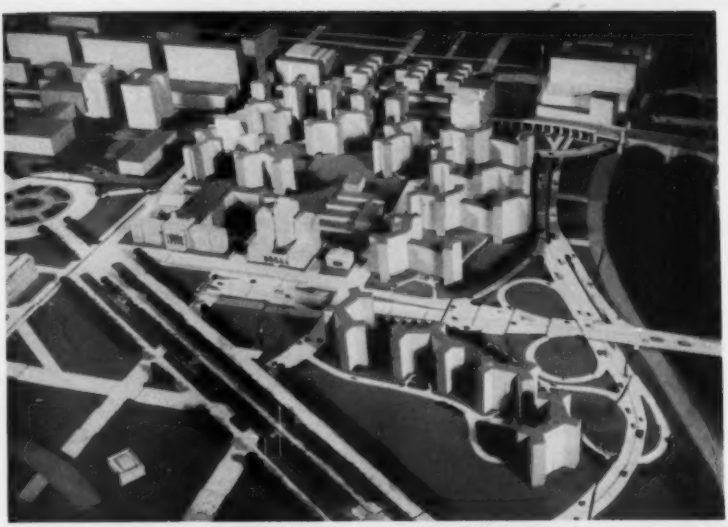

FIG. 1. Sketch model built to scale in 10 days shows long-range plans to be included in later detail studies.

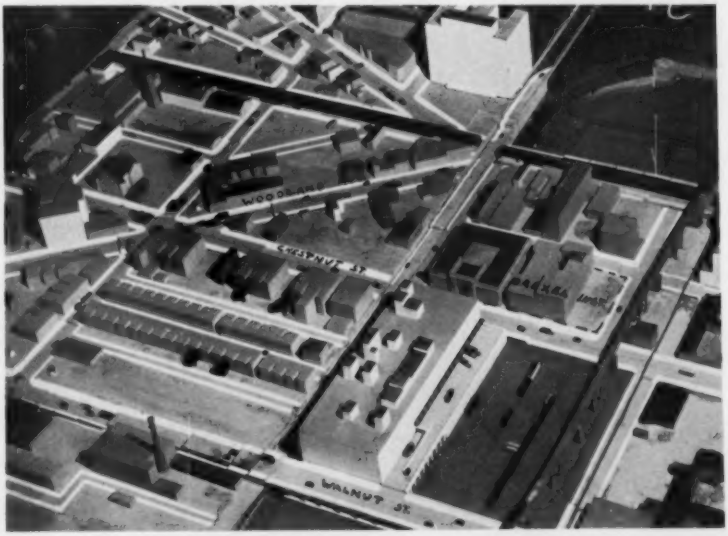


FIG. 2. "Before" side of Downtown Model shows mixed land use, under-developed but in proximity to valuable transportation, business, and cultural centers.

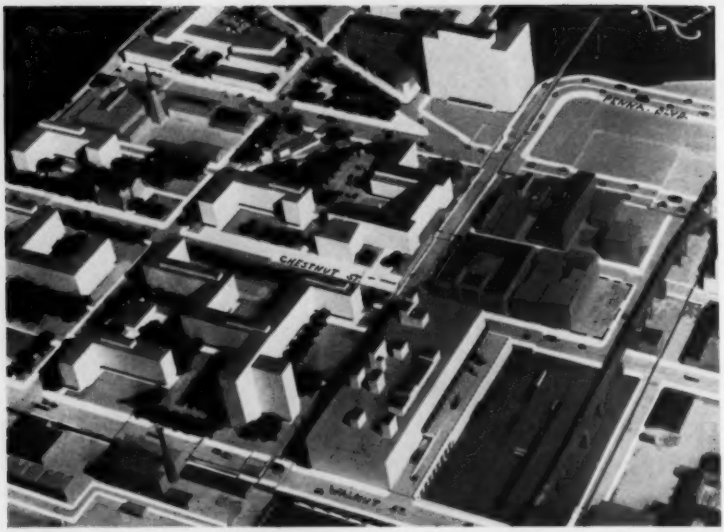


FIG. 3. The 3-way intersections eliminated; one block used to expand a campus, another new block provides new housing.

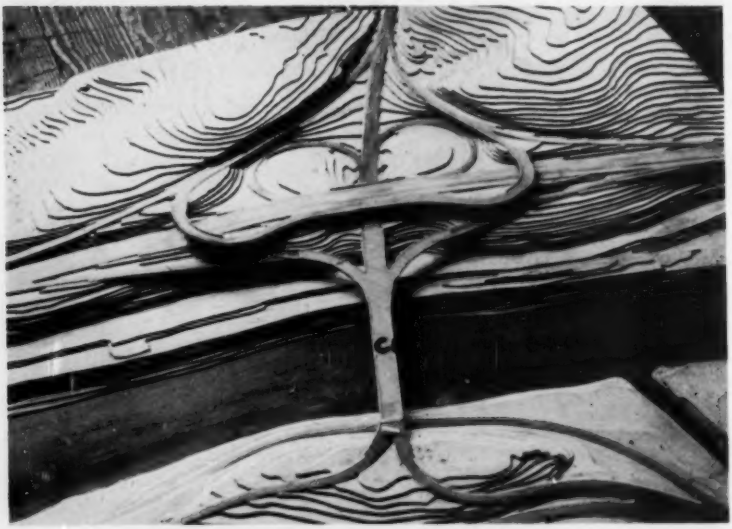

FIG. 4. Photos taken during construction of 100-inch scale model. All roads shown are accurate to 1 foot, 6 inches.

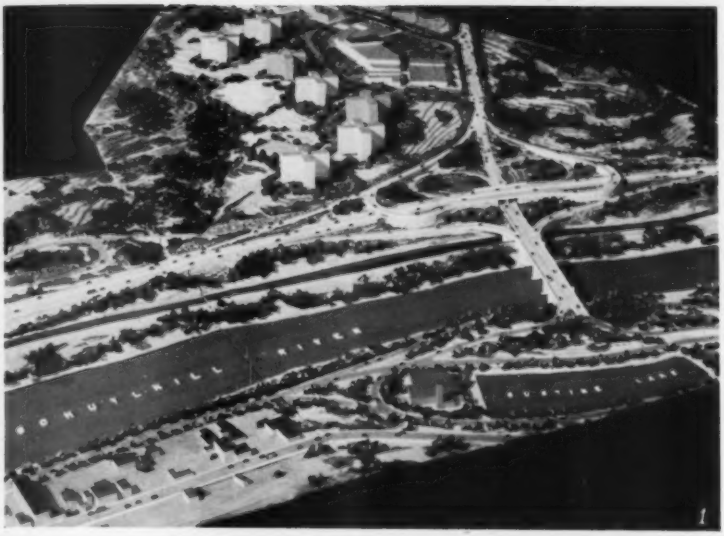

FIG. 5. Same model as Figure 4, after the third of six major revisions.

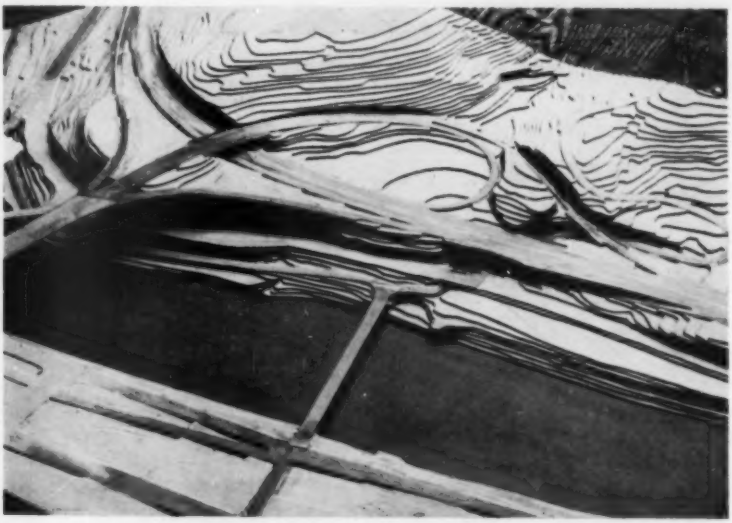

FIG. 6. Another preview of some engineering headaches.

FIG. 7. Scale of model, 1 inch equals 100 feet. All sections of the model are still subject to intensive study.

FIG. 8. Schuylkill Expressway in the foreground; new Vine Street Bridge left of center.

drawing board, and transported (in lots of eight or ten) in an automobile. (b) Models must be flexible. It should be possible to add sections for further study without resorting to irregular or over-size shapes. Highways represent a difficult problem in this respect because the models tend to assume "string bean" shapes. Working back from a theoretical ultimate of full coverage, an area can be gridded so that selected panels are built first, with the later work dovetailing in to fill the gaps as needed. This flexibility will be found useful in that small sections can be detached for study, revision, or exhibition, without the rest of the model being disrupted. Planning itself is supposed to be a flexible and continuous process; the models used by planners should reflect this idea. (c) Scale models must be used—not only by the governmental authority or the engineering firm responsible for a given project, but by all related groups. Planning authorities recognize that highways are intimately related to every other phase of city and regional planning, in many cases being an almost overwhelming pre-occupation. A properly conceived scale model of a highway would be of positive benefit in related planning problems, for the relationships to other phases of planning would be clearly demonstrated. This also has the practical advantage of amortizing the initial cost of the model over several related projects. Indeed, it would be fair to share the cost of the model as well as the benefits.

### And the Cost . . .

A careful analysis of modelmaking costs over a period of five years reveals two areas of greatest expense, (a) the preliminary drafting; (b) the final art work. To take up the first item, one of the obvious time-consumers is that of translating drawings to scale. Then the drawings, invariably on several sheets, must be compiled. This involves a sorting out of past, present and proposed lines, which are generally on the same drawing. A careful modelmaker never takes any dimensions for granted on a drawing. More than one printing or lettering error has been discovered in this phase.

Two cases come to mind in which inaccuracies on completed drawings were discovered in the course of preparing the special

drawings for scale models. The amount saved by this discovery, before construction of the models was fairly begun, amounted to many times the cost of the models.

The expense of the "artwork" can be traced to two main causes. One is over-detailing. A few suggestive touches are more effective than painting "every window." Note again the "realism" in Figure No. 8: the literal realism method was tried originally and it was a failure. The other cause lies in revisions. Touch-up jobs in the painting stage are always laborious. But these revisions are certainly cheaper than making new models.

The models illustrated in this article have been used by the Philadelphia City Planning Commission, Redevelopment Authority, Housing Authority, Art Jury, the State Highway Department, the Public Roads Administration, and the Urban Land Institute. Many architects, real estate concerns, industrialists, and public utilities have also made direct use of the information presented by the models. There have been extensive showings to the general public (conservative estimates of more than one million.) The work is subject to continuing study and revision.

The scale model is a tool or instrument. As such it partakes of the qualities of the user, revealing limitations, extending potentials. Certainly the formidable tasks of modern highway planning call for every skill at our command.

# The Connecticut Point System

CHARLES F. KELLEY

*Mr. Kelley is Motor Vehicle Commissioner of Connecticut. From 1947 to 1949, he was Deputy Commissioner under Commissioner Elmer S. Watson. Previously, Mr. Kelley was with the New York Telephone Company; in the nursery business in Milford, Connecticut; and an executive of the General Electric Corporation.*

AS Commissioner of Motor Vehicles for Connecticut it is often an unpleasant but legal duty to suspend a driver's license or right to operate a motor vehicle upon the highways of Connecticut.

Certain of these duties are mandatory and leave no option but to suspend or revoke a license issued to a person who has been convicted of violating a statute relating to motor vehicles; who has been charged with such an offense and has forfeited a bond for appearance in court; who has had a charge nolled on payment of any sum of money, or who has received a sentence upon which execution is suspended. These mandatory suspensions present no problem.

However, the legislature has clearly delegated to this office the duty of removing from the highway those drivers whose records show that they cannot or will not drive in a safe and proper manner. The Superior Court has held that there is "no doubt of the legislative intention to vest the Motor Vehicle Commissioner with power to suspend and revoke operators' licenses in instances where no conviction for violation of statutes relating to motor vehicles is involved."

This power must of course be used with discretion and to insure the equal and just treatment of all license holders, we have devised a system of weighting or pointing all accidents, convictions in court, police reports, or warnings from police officers. Complaints from fellow motorists are also weighted and placed upon a driver's record, but not until a hearing is held. It is impossible for a Connecticut license-holder not to know about the items placed upon his record. He must be stopped by a policeman and arrested or warned, he must have had an accident, or he must have attended a hearing in the case of a public complaint of improper driving.

### Connecticut Point System

The Connecticut Point System operates upon the premise that a motor vehicle violation "is a sympton of an accident to come." If we can impress upon the relatively small number of drivers who get in trouble the need of safe, careful and courteous driving, if we can reduce our accident toll by one, we will feel justified in our efforts.

New legislation was not necessary to inaugurate our Point System. The necessary laws had been enacted early in the history of the department. In Connecticut, the Commissioner of Motor Vehicles is granted broad powers by statute: Section 2456 (a) gives him power to suspend or revoke a license, registration, or right to operate "for any cause that he may deem sufficient, with or without a hearing," and the power to suspend for definite periods of time and for definite offenses. Section 2460 empowers him to waive any official action for first offenders. Section 2455 provides for hearings, administering oaths and penalties for false swearing or false affirmation.

Section 2458 provides for an appeal from the decision of the Commissioner, but the history of the Connecticut Motor Vehicle Department contains only four cases where an appeal has been made; in all but one the courts have upheld the decision of the Commissioner.

We believe that a certain amount of flexibility should be incorporated in a point system and we inform the driver that our point scale is subject to revision as any need arises. A statute covering a point system might have the disadvantage of setting up a law that would tie the commissioner's hands and forbid him to consider the peculiarities of individual cases.

Arbitrarily assessing points for accident responsibility may be a cause of criticism but after careful analysis by the accident section, responsibility is established (the degree of responsibility need not be considered—one driver may have failed to stop at a stop sign, the other was exceeding the speed limit—responsibility on the part of both) a point is assessed each driver. A driver can in most cases be made to see his responsibility without the necessity of calling for the file. The hearing officer, after hearing additional evidence or

Young driver seeking to have his license privileges returned after suspension is given a hearing closely akin to a court proceeding, an official transcript is made.

Youth filling out one of Connecticut's new written tests on motor vehicle laws under the supervision of a State Motor Vehicles Inspector. If this examination and an eye test are passed, the applicant will be taken out for a road test.

reports not available to the accident analyzers, may change the responsibility. We have experienced little criticism on this point and we had anticipated a great deal. Perhaps the fact that a low weight is given to this accident responsibility is the reason for its acceptance.

We had also anticipated difficulty with the police warning. To assess a point when a driver had been warned and a report of the warning sent to us, seemed at first glance undemocratic. The driver is accused by the police officer, but has not had the right to defend himself.

Our system does give him that right, but not until he has received seven such warnings or amassed seven points in any way. Seven points call for a formal hearing to show cause why a license should not be suspended, and at this hearing the driver may give his side of the story on any warning, accident, or even a court conviction. No license is suspended under the point system without a hearing. Automatic suspensions or revocations are of course provided for by statute.

### Operation of the System

Actual operation of the system, the office routine, is simple and was installed without additional personnel. As each new item is added to our Master Record, the file clerk totals the points and if the point score is three or over, instead of returning the record to the file, she "charges" it to our Driver Clinic and sends the full record to that section for review. The review is made by a hearing officer or under his direction. Warning letters are sent for three points, directly from the Clinic Section. Conferences are scheduled for five points and hearings for seven. Both the conference and hearing are scheduled in a city near the home of the driver and the hearing officers go to each location as the cases for that section accumulate.

An effort is made to keep the warning letter and the conference on a friendly plane—to seek the cooperation of the driver—but if he continues to add to his record the hearing and suspension action is in the offing. A short suspension at first and then, depending upon each case and the hearing officer's judgment, a longer suspension or revocation. A schedule of minimum suspensions has been set for those

few drivers who fail to heed warnings and continue to add to their records. Depending on the last item on the record, these minimum suspensions run from five to thirty days.

Acceptance of this plan by the very people it was set up to reach has been remarkable. Drivers who have been warned have written in to say "Thank you for your kind and courteous letter. . ." or "I feel that this is a very fine program. . ." "Many thanks for a friendly warning. . ." "Please be assured that I will do my best to observe all the regulations. . ." "Your warning has been well taken and I am glad I live in Connecticut and have a Department of Motor Vehicles interested in the welfare of its pedestrians and drivers. More power to you all." These from drivers who were either warned by letter or called to a conference. Of course we have had some complaints, but oddly enough almost all complaints come from the few drivers with the longest or more serious records.

James Stannard Baker in his book, *"Driver Improvement,"* published by the American Association of Motor Vehicles (1950) says, "To deal with licensed drivers who cannot, do not know how to, or simply will not behave safely, the law also provides for a licensing activity in addition to examining. It may be called 'driver improvement' because its function is to improve the general quality of licensed drivers. To make this function effective requires authority to do many things, including taking some bad drivers from the highway by suspension or revocation."

Connecticut law has for many years made this provision and although our accident rate is higher than it should be, it still is better than the average. Suspension is of course only one cog in the wheel of our safety program and without the efficient patroling of our highways no safety program would be possible.

Suspension procedure depends upon reports sent to us by other authorities. Some of this reporting is required by law and some is the result of effective cooperation between all agencies.

The department maintains a central file called a master record on which each bit of information on a driver is noted. Accidents, court convictions, and warnings from the police are filed here; also records of suspensions and reinstatement, hearings and conferences. In addition the master record refers to special reports, transcriptions

of hearings and other information not necessary for a quick reference, but valuable when reviewing a driver's record. This record is not confined to the driver's offenses on Connecticut highways; reports from all states concerning Connecticut license holders are found here.

Our point system brings up for attention those drivers who seem to have more than their share of trouble. We know which drivers need attention. We would rather correct driving faults than suspend licenses but at present we can only warn those drivers who are accumulating records and when the warning is unheeded we must suspend.

### Driver Re-examination

For some time we have been working on a re-examination for drivers with records of violations or accidents. This re-examination must be much more than the road test; in fact the road test on a re-examination is in nearly every case useless. For instance, a driver had been warned by two state policemen for passing stop signs and after an accident at a stop sign was called for a re-examination. The inspector reported that during the road test, this man stopped, waited, shifted gears and carefully entered the main highway. He drove just under the speed limit, made left turns without cutting corners and scored perfectly on all counts. As he left the inspection yard he was followed by a second inspector in a private car who observed him as he went through the first stop sign he came to without slowing up at all. He cut corners and cut in on cars in passing. We called him back and still have his license.

The most reckless driver is able to pass our road test because he is on guard. Someday we shall have a re-examination that will test such a driver—an examination that will tell something about a person's driving attitude or temperament. Experts can test a person in these fields now, but such tests are long and require a specialist to administer. We shall be able to devise a test that can be administered by an inspector specially trained for the job. Until such a test is devised we can only call a driver's faults to his attention and suggest that he correct them. If he fails to change his driving habits we must suspend.

We have a method for separating good from bad drivers, but not until they have done damage. If we could by modern testing methods predict how a driver would react on the highway we would undoubtedly refuse licenses to many now receiving this responsible permit. I have recently revised our initial road test and added a written examination on Connecticut law and safe driving practice. This new examination is proving successful and is putting a better driver on the road. At least a driver who passes our examination knows the law and most of the rules of safe driving.

We won't know until later whether he applies his knowledge and is able to control the temptation to cut corners, drive at excessive speeds, and indulge in other bad driving practices that cause accidents. Whether he will remain alert and give his driving the attention that must be given or whether he will feel he can drive along crowded highways while trying to solve his domestic problems or make some business decision, cannot be known. Perhaps he will never know that it cannot be done, because one day while his mind is on some trouble at home or in the office, he will forget his driving just long enough to be listed by our statistical section. Why a driver who is careful at his work, careful in his home, even careful when walking across the street, will step into his car and feel that he can give half of his attention to his passengers or to some problem that is troubling him or even to day dreaming, is a mystery to everyone concerned with highway safety.

The Commissioner's duty is to license drivers, and to recall the license of any driver who has shown he is not a proper person to hold a license. The right to operate a motor vehicle is not one of the inalienable rights guaranteed by our Constitution. It is a privilege. If it were a legal right no license would be necessary. Before this privilege is granted, the person receiving the privilege must demonstrate that he has necessary intelligence and physical ability to be worthy of the license. If at any time thereafter either of these qualifications are lacking, the Commissioner must suspend or revoke such license.

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